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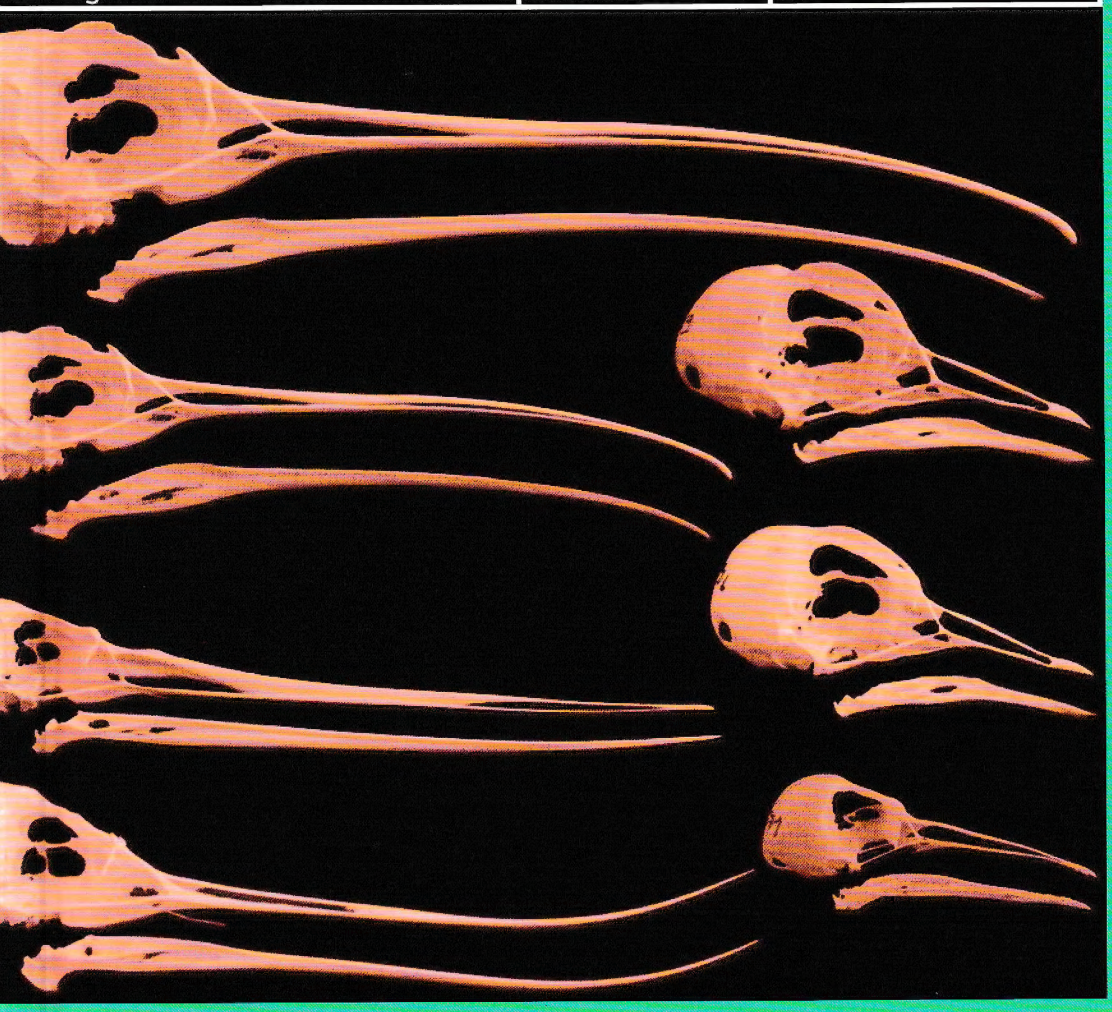

STUTTGARTER BEITRÄGE ZUR NATURKUNDE

A | Biologie

Land snails from Brazil ■ Terrestrial isopods from Oman ■ New genera of Caeninae ■ Revision of *Zyras* from China ■ New and little known Tenebrionidae from Borneo ■ *Menimus* from Peninsular Malaysia ■ Southern African Osminiini ■ Skull identification key for Central European shorebirds

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A new species of *Kora* from Bahia, Brazil (Gastropoda: Pulmonata: Orthalicoidea), with an emended diagnosis of the genus

Rodrigo B. Salvador & Luiz Ricardo L. Simone

Abstract

A new species of land snail was recently found in the municipalities of Carinhanha, Serra do Ramalho and Coribe, western Bahia state, Brazil. It is described herein as *Kora rupestris* **n. sp.** and can be easily recognized from its congeners by its usually narrower shell and aperture, and especially by its protoconch sculpture pattern. In light of this new discovery, new emended diagnosis and description are provided for the genus *Kora*, and two taxa previously described under this genus are excluded, being transferred to the genus *Drymaeus* [*D. iracema* (Simone, 2015) **n. comb.** and *D. terreus* (Simone, 2015) **n. comb.**]. The region where the new species was found consists of a contact zone of the Caatinga and Cerrado biomes. Such regions are proving to be quite diverse and a more thorough knowledge of their fauna is of utmost importance for future conservation efforts.

Keywords: Bulimulidae, Carinhanha, Caatinga, Cerrado, *Kora rupestris* new species.

Zusammenfassung

Eine neue Landschneckenart aus Brasilien wurde kürzlich in den Gebieten von Carinhanha, Serra do Ramalho and Coribe im Westen des Bundesstaates Bahia festgestellt. Sie wird hier als *Kora rupestris* **n. sp.** beschrieben und ist von anderen Arten der Gattung *Kora* leicht zu unterscheiden durch ihre üblicherweise schmalere Schale und Mündung, vor allem aber durch die Skulptierung des Protoconchs. Aufgrund dieser neu entdeckten Art wird eine aktualisierte Diagnose und Beschreibung der Gattung *Kora* gegeben und zwei zuvor in dieser Gattung beschriebene Arten werden in die Gattung *Drymaeus* gestellt [*D. iracema* (Simone, 2015) **n. comb.** und *D. terreus* (Simone, 2015) **n. comb.**]. Die Region, in der die neue Art gefunden worden ist, stellt eine Berührungszone der Caatinga- und Cerrado-Biome dar. Solche Kontaktzonen sind sehr artenreich und eine bessere Kenntnis ihrer Fauna ist von hoher Bedeutung für künftige Naturschutzbestrebungen.

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2 Material and methods 1
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1 Introduction

Kora Simone, 2012 (Gastropoda: Pulmonata: Orthalicoidea) is an endemic central-eastern Brazilian genus of pulmonate land snails, occurring in the Caatinga biome of the states of Bahia and Minas Gerais (Simone 2015). The genus currently includes four species: *Kora coralina* Simone, 2012 (the type species), *K. iracema* Simone 2015, *Kora nigra* Simone, 2015 and *K. terrea* Simone, 2015. New material from Bahia (and re-examination of the material studied by Simone 2012, 2015) has brought to light yet another species, which is described below. Moreover, in light of this new discovery, an emended diagnosis for the genus *Kora* is provided herein.

Acknowledgements

We are deeply grateful to José Coltro (Femorale) and Maria E. Bichuette (Universidade Federal de São Carlos, Brazil) and their respective teams for the donation of the material studied here; to Daniel C. Cavallari (MZSP) for locating the material of the J. Vaz collection; to Karin Wolf-Schwenninger (SMNS) for her help with ESEM images; to Francisco J. Borrero and an anonymous reviewer for their helpful comments on the manuscript. This work was partly supported by a doctorate grant from CNPq (Conselho Nacional de Desenvolvimento Científico e Tecnológico, Brazil; proc. #245575/2012-0) to R. B. S.

2 Material and methods

The material of the new species described herein was recovered in the municipalities of Carinhanha and Serra do Ramalho, western Bahia state, Brazil (Fig. 1), and is listed and discussed below. For detailed examination of the protoconch, uncoated samples were mounted on stubs and observed under an Environmental Scanning Electron Microscope (ESEM) in the SMNS.

Furthermore, in order to present emended generic diagnosis and description of the genus *Kora*, all available material described in the genus *Kora* was analyzed (see Simone 2012, 2015 for more detailed information on these lots): *Kora*

Fig. 1. Map showing the presently known distribution of *Kora rupestris* n. sp., the municipalities of Carinhanha (type locality), Serra do Ramalho and Coribe. – Abbreviations of neighboring states: MA, Maranhão; PI, Piauí; PE, Pernambuco; AL, Alagoas; SE, Sergipe; TO, Tocantins; GO, Goiás; MG, Minas Gerais; ES, Espírito Santo.

corallina: MZSP 103910 (holotype; Bahia state, Santa Maria da Vitória); MZSP 103911 (paratype; from type locality); MZSP 103912 (paratype; from type locality); MZSP 103913 (paratypes; 32 shells; from type locality); MZSP 104033 (>50 shells; from type locality); MNHN IM-2012-37362 (paratypes; 2 shells; from type locality); MNRJ 30377 (paratypes; 2 shells; from type locality); USNM 1157009 (paratypes; 2 shells; from type locality). – *Kora iracema*: MZSP 104964 (holotype; Bahia state, São Desidério). – *Kora nigra*: MZSP 106232 (holotype; Bahia state, Serra do Ramalho); MZSP 104839 (paratypes; 5 shells; unknown provenance, but likely from type locality); MZSP 106241 (paratype; from type locality); MZSP 106250 (paratypes; 2 shells; from type locality). – *Kora terrea*: MZSP 106215 (holotype; Minas Gerais state, Presidente Olegário).

Abbreviations

D	shell greatest width
d	aperture width
H	shell length
h	aperture height
S	spire (excluding aperture)
S'	spire (excluding body whorl)

Acronyms of Institutions

MNHN	Museeé National d'Histoire Naturelle (Paris, France)
MNRJ	Museu Nacional da Universidade Federal do Rio de Janeiro (Rio de Janeiro, Brazil)
MZSP	Museu de Zoologia da Universidade de São Paulo (São Paulo, Brazil)
SMNS	Staatliches Museum für Naturkunde Stuttgart (Stuttgart, Germany)
USNM	National Museum of Natural History, Smithsonian Institution (Washington D. C., USA).

3 Systematics

Superfamily Orthalicoidea
Family Bulimulidae
Genus *Kora* Simone, 2012

Type species: *Kora corallina* Simone, 2012; Recent, Brazil.

Included taxa: *Kora corallina* Simone, 2012 (Figs. 2, 12–14); *K. nigra* Simone, 2015 (Fig. 3); *K. rupestris* n. sp. (Figs. 4–11, 15–17).

Original diagnosis (Simone 2012: 432)

"Outline fusiform; spire tall, somewhat turriform. Protoconch simple, paucispiral, ornamented by scanty axial cords. Umbilicus narrow. Peristome somewhat away from longitudinal axis of spire. Peristome deflected. Inner lip with strong, oblique tooth in middle level."

Emended diagnosis

Shell conical-fusiform. Color initially lighter, becoming darker towards aperture; light-colored subsutural spiral band always present. Protoconch (~2 whorls) initially smooth, becoming sculptured by well-marked sinuous axial ribs later on, which gradually increase in strength until they become similar to teleoconch sculpture; proportion of whorls with and without sculpture pattern varies interspecifically and ribs of "transitional" strength might not be present. Transition from proto- to teleoconch not clearly marked. Teleoconch sculptured by sinuous prosocline axial ribs. Aperture broad, slightly expanded laterally, away from the shell axis. Peristome reflexed. Columellar lamella oblique. Umbilicus narrow, but well-marked.

Discussion

The set of diagnostic features of the genus *Kora* allows a clear distinction from other orthalicoid genera. The main characters are analyzed below; the most important of which is the protoconch sculpture pattern.

Shell: The shell seems to be conservative within the genus, with all species displaying a conical-fusiform shell, differing only in its proportions and absolute size. As already pointed out by Simone (2012), the degree of intraspecific conchological variation of *Kora* species is not high (*K. corallina* is known from several dozens of specimens): the variation in size is small, but shape can go from narrower to broader shells, the latter sometimes also with a broader aperture.

Color: Both *K. corallina* and *K. rupestris* n. sp. have initially light-colored shells, which become clearly darker towards the aperture. *Kora nigra* is more uniformly colored, although the same pattern may be observed. Variation in overall coloration and color pattern is seen only interspecifically in *Kora* (at least in the presently available material). A great amount of variation (both inter- and intraspecific) is common in other orthalicoid genera, such as, for instance, *Drymaeus* Albers, 1850 and *Leiostracus* Albers, 1850, but is minimal in others, such as *Plekocheilus* Guilding, 1828 and *Dryptus* Albers, 1860 (e. g., Simone 2006; Breure & Mogollón Avila 2010; Borrero & Breure 2011; Salvador & Cavallari 2013; Salvador et al. 2015). A constant feature of the genus seems to be a lighter-colored spiral band right below the suture.

Aperture: A reflexed peristome is found in all presently-known species of *Kora*. This is not exclusive of *Kora* and can be seen in many orthalicoid genera (e. g., Simone 2006), although this feature is not necessarily constant throughout each genus.

Apertural barriers: The columellar lamella seen in *Kora* is a recurrent feature in orthalicoid families (and its presence/absence may vary within some genera) and might not be very useful for diagnosis and phylogenetic analyses. As pointed out by Simone (2012), other Brazilian orthalicoid genera with a similar lamella are *Dryptus*, *Plekocheilus* and *Eudolichotis* Pilsbry, 1896. A similar lamella is known in the family at least since the Late Paleocene or Early Eocene, as shown by the fossil genus *Itaborahia* Maury, 1935, from Rio de Janeiro state (Salvador & Simone 2013).

Protoconch: The most characteristic feature of the genus *Kora* is the protoconch. The protoconch (~ 2 whorls) is initially smooth, becoming sculptured by well-marked sinuous axial ribs later on, which gradually increase in strength until they become similar to teleoconch sculpture. The exact numbers of smooth and sculptured whorls varies interspecifically (Figs. 12–17). The transition from proto- to teleoconch is weakly marked.

On the one hand, both *K. corallina* (Figs. 12–14) and *K. nigra* have the first ~ ¼ whorl smooth; the next ~ 1½ whorl is sculptured by faint axial striae; close to the final ~ ¼ whorl, these striae become more strongly marked, equal to the teleoconch's ribs. On the other hand, *K. rupestris* n. sp. (Figs. 15–17) has the first 1½ to 1¾ whorl smooth; the last ½ to ¼ whorl has the same strong axial ribs as the teleoconch. This means that the "transitional" faintly striated region is not usually present in *K. rupestris* n. sp., but a single specimen shows very faint axial striae immediately before the onset of the thicker teleoconch-like ribs.

This axial sculpture pattern of the protoconch is similar to that of the genus *Naesiotus* Albers, 1850 and *Rabdotus* Albers, 1850, with its sinuous and well-marked axial ribs (Breure 1978, 1979; Breure & Coppois 1978). Nevertheless, these two genera show the entire protoconch covered in ribs, contrary to *Kora*, which has a smooth region before the beginning of the ribbed area. Finally, as pointed out by Simone (2012), *Neopetraeus* von Martens, 1885 also has axial riblets similar to *Kora*, but its protoconch is also sculptured by fine spiral striae, giving it a reticulate appearance (Breure 1979).

In addition, the protoconchs of *Naesiotus* spp. exhibit a lower number of axial ribs than those of *Kora*; the number of axial ribs in the protoconch of *Rabdotus* spp. is intermediate between those of species of *Naesiotus* and *Kora* (Breure 1978, 1979). The pattern of the protoconch sculpture, closely reminiscent of *Naesiotus* and *Rabdotus*, might indicate the placement of the genus *Kora* in the family Bulimulidae (as per Breure & Romero 2012) instead of the originally proposed allocation in Orthalicidae (Simone 2012). Protoconch sculpture tends to be a good indicative of the relationship between taxa, but the family Bulimulidae also counts with genera with very distinct protoconch patterns, such as *Drymaeus* (Breure 1978, 1979; Breure & Romero 2012). As such, the importance of this character in the classification of the Orthalicoidea remains somewhat uncertain.

Finally, the protoconchs of *Kora iracema* Simone, 2015 and *K. terrea* Simone, 2015 exhibit a completely reticulated sculpture pattern, thus lacking the characteristic protoconch of *Kora*. This conformation is characteristic of the genus *Drymaeus* (Breure 1979). Moreover, their overall shell shape, aperture shape, lack of a strong columellar fold, and greatly reflexed peristome are also befitting of the genus (Breure 1978, 1979; Simone 2006). As such, both species are here transferred to this genus as *Drymaeus iracema* (Simone, 2015) n. comb. and *D. terreus* (Simone, 2015) n. comb.

Kora rupestris **n. sp.**
(Figs. 4–11, 15–17)

Kora corallina: Simone 2015 [in part]: 53 (figs. 14, 22).

Holotype: MZSP 121416 (A. Bianchi col., VIII.2012; Figs. 4–7, 15–17).

Paratypes: MZSP 121441 (2 shells, from type locality; A. Bianchi col., VIII.2012; Figs. 8–9).

Additional material: MZSP 106230 (1 shell; Serra do Ramalho municipality, Gruna das Três Cobras; 14°19′S 43°47′W; alt. 440 m; M. E. Bichuette col., 10.IX.2008; Fig. 10). MZSP 107996 (1 shell; Coribe municipality; J. Vaz collection; M. U. T. Rodrigues col., I.1980; Fig. 11).

Type locality: Brazil, Bahia, Carinhanha municipality (city center coordinates: 14°18′18″S 43°45′54″W), under rocks on Canabrava Hill. Unfortunately, more precise locality data, such as coordinates and altitude, were not recorded by the collector.

Etymology

From the Latin "rupestris", meaning "of rock", "montane". Reference to the rocky mount where the types were collected.

Figs. 2–11. *Kora* spp. from Bahia state, apertural (2–4, 8–11), umbilical (7), lateral (5), and dorsal (6) views. – **2**. *K. corallina* (holotype, MZSP 103910; H = 43.4 mm). **3**. *K. nigra* (holotype, MZSP 106232; H = 30.1 mm). – **4–7**. *K. rupestris* n. sp. (holotype, MZSP 121416; H = 37.7 mm). – **8**. *K. rupestris* n. sp. (paratype #1, MZSP 121441; H = 35.5 mm). **9**. *K. rupestris* n. sp. (paratype #2, MZSP 121441; H = 33.3 mm). **10**. *K. rupestris* n. sp. (MZSP 106230; H = 34.2 mm). **11**. *K. rupestris* n. sp., apertural view (MZSP 107996; H = 35.6 mm).

Distribution

Known only from the type locality and the neighboring municipalities of Serra do Ramalho to the north and Coribe to the west (Fig. 1).

Habitat

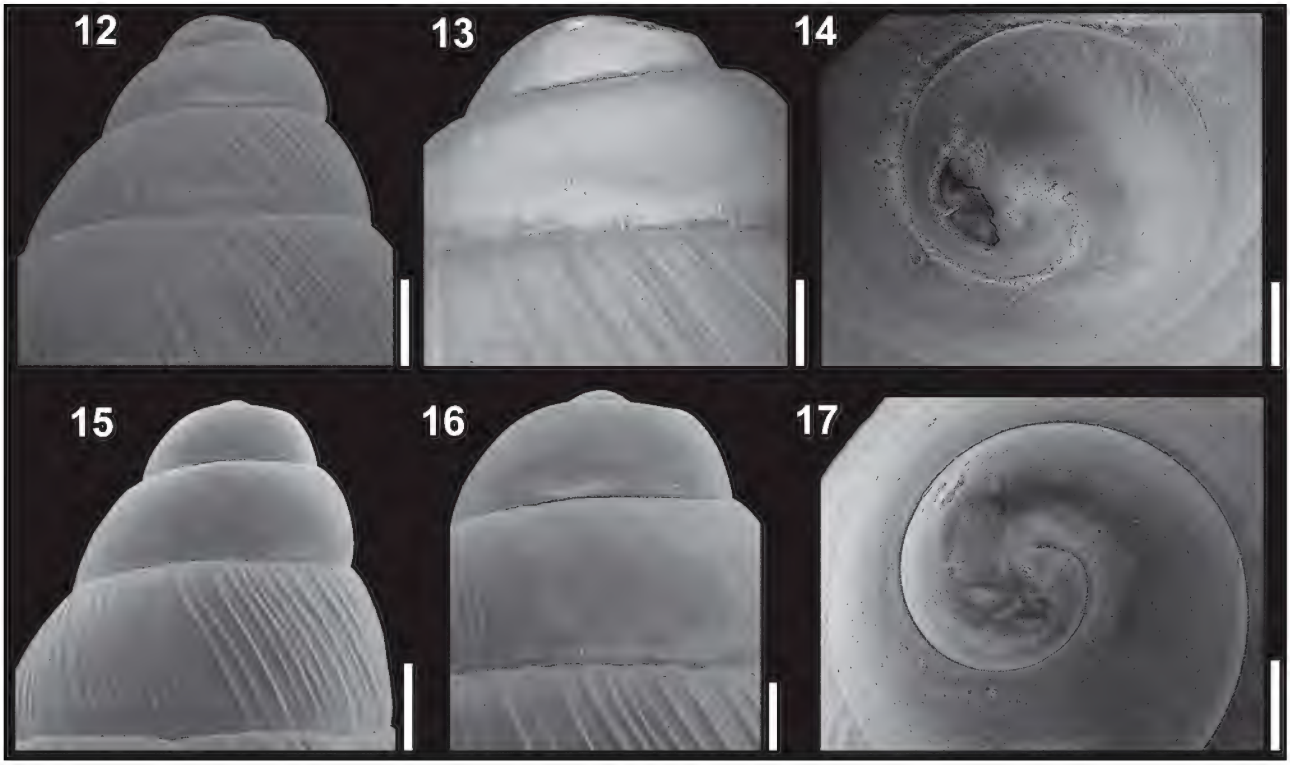
Caatinga shrublands.

Diagnosis

Shell slender. Shell color comprised of light tones of brown. Protoconch sculpture pattern: first 1½ to 1¾ whorl smooth; last ½ to ¼ whorl sculptured by well-marked axial striae. Aperture narrow.

Description

Shell large (~ 35 mm), conical-fusiform, slender; greatest width on body whorl; shell width ~ 2/5 shell length (Figs. 4–6, 8–11). Shell color light brown; last whorl increasingly darker; narrow stripe immediately below the suture slightly lighter than remainder of whorl (Figs. 4–6). Peristome white. Spire angle usually ca. 45°, but up to ca. 50° in broader specimens. Protoconch (~ 2 whorls; Figs. 15–17) rounded; first 1½ to 1¾ whorl smooth; last



Figs. 12–17. *Kora* spp. from Bahia state, lateral (12–13, 15–16), and apical (14, 17) views. – **12**. *K. corallina*, proto- and teleoconch sculpture (paratype, MZSP 103913). **13**. Same, in higher magnification, showing the transition from faint to more marked sculpture. **14**. Same, showing the transition from smooth to faintly sculptured protoconch. **15**. *K. rupestris* n. sp., lateral view of proto- and teleoconch sculpture (holotype, MZSP 121416). **16**. Same, in higher magnification, showing the transition from smooth to sculptured protoconch. **17**. Same, showing the almost entirely smooth protoconch. – Scales: 1 mm (12, 15), 0.5 mm (13–14, 16–17).

½ to ¼ whorl sculptured by well-marked axial striae (same as teleoconch); transition to teleoconch not clearly marked, prosocline, simple. Teleoconch sculptured by sinuous prosocline axial striae (Fig. 15). Whorl profile lightly convex. Suture well-marked, but not deep. Body whorl almost ⅔ shell length. Aperture oval, prosocline, proportionately large, slightly expanded laterally away from shell axis; aperture ~ ½ shell length, ~⅔ shell width. Columellar lamella well-marked, variable in size, oblique to shell axis (Figs. 4, 8–11). Peristome greatly reflexed. Umbilicus narrow (Fig. 7).

Measurements (in mm). Holotype: 6½ whorls; H = 37.7; D = 16.3; S = 19.4; S' = 13.7; h = 18.2; d = 11.4. – Paratype #1: 6¼ whorls; H = 35.5; D = 15.3; S = 18.6; S' = 12.4; h = 16.5; d = 10.7. – Paratype #2: 6¼ whorls; H = 33.3; D = 14.8; S = 17.1; S' = 12.2; h = 16.5; d = 10.2. – MZSP 106230: 6¼ whorls; H = 34.2; D = 15.9; S = 17.9; S' = 12.0; h = 15.9; d = 11.1. – MZSP 107996: 6½ whorls; H = 35.6; D = 18.2; S = 18.3; S' = 13.1; h = 17.6; d = 12.1.

Differential diagnosis

Kora rupestris n. sp. can be easily diagnosed by its different protoconch sculpture pattern (see the discussion of the genus, above, for the comparison with *K. corallina* and *K. nigra*). Moreover, *K. rupestris* n. sp. (Figs. 4, 8–11) has a more slender shell and spire than *K. corallina* (Fig. 2) and *K. nigra* (Fig. 3), which also results in a slightly narrower aperture; both *K. corallina* are and *K. nigra* are very broad, as also reflected in their greater spire angle values of 45–50° (*K. corallina*) and 60–65° (*K. nigra*). However, there are more slender specimens of *K. corallina*, which present the same shell length/width ratio as *K. rupestris* n. sp. Such specimens may be diagnosed by size (besides the protoconch), as the shell of *K. rupestris* n. sp. is smaller than that of *K. corallina*, having approximately ¾ of the shell length of the latter, with no overlap in their size ranges. *Kora rupestris* n. sp. is slightly larger than *K. nigra*, although some doubtful specimens of the latter (MZSP 104839) are in the upper size range of *K. corallina*. Furthermore, *K. rupestris* n. sp. shows ½ to ¾ less whorl in the teleoconch, when compared to *K. corallina*, although it has the same whorl count as *K. nigra*. Finally, the color pattern of *K. rupestris* n. sp. (Fig. 4) is similar in nature to that of *K. corallina* (Fig. 2), but it is usually comprised of overall lighter tones of brown; *K. nigra* has a more homogenous dark coloration (Fig. 3).

The single specimen (MZSP 106230) recovered in a cavern and identified by SIMONE (2015: figs. 14, 22) as *K. corallina*, in fact belongs to *K. rupestris* n. sp. It agrees with *K. rupestris* n. sp. in size, overall shape and, more importantly, the protoconch sculpture pattern. This single specimen is slightly broader than the type specimens of *K. rupestris* n. sp., with a narrower umbilicus, proportionately smaller aperture and displaying a stronger white parietal callus. Nevertheless, this same kind and extent of variation is seen in the type series of *K. corallina*, and is thus considered here intraspecific variation of *K. rupestris* n. sp.

4 Concluding remarks

Carinhanha and Serra do Ramalho municipalities, the known distribution of *Kora rupestris*, are located in western Bahia state (Fig. 1), on the west banks of the São Francisco River. It is an interesting region, consisting of a contact zone of the Caatinga and Cerrado biomes, with the hypoxerophytic forests of the former and stretches of the open deciduous forest of the latter (SÁ et al. 2003). The climate is considered tropical dry (semiarid), with a dry winter season and rain concentrated on the end of spring and beginning of summer. It is a limestone-rich region, which seems to be favorable for land snails, perhaps especially for those with sturdy shells (e. g., SALVADOR & SIMONE 2014).

The Caatinga biome, despite being usually considered of low biodiversity levels, is now revealing an amazing array of species, across all main terrestrial and freshwater taxa and including several endemic species (e. g., TABARELLI & SILVA 2002). Nevertheless, there are still proportionally few works on this fauna, which is often not included in conservation measures (e. g., SILVA et al. 2003). This is especially troubling, since circa 20 % of the Caatinga is already considered degraded (SÁ et al. 2003) and continental mollusks are considered the most imperiled group of animals, with the highest extinction rates (LYDEARD et al. 2004; RÉGNIER et al. 2008). The more arid habitats are normally seen as an adverse place for land snails (which depend so much on preserving water), but it appears that the Caatinga may still hide many new snails (e. g., SALVADOR & SIMONE 2014; SIMONE 2015). This is especially true due to the limestone-rich environments of this biome, which allow land snails to thrive, but which are now threatened by mining activities (SIMONE 2015). Moreover, the specimens of *Kora nigra* and *Drymaeus iracema* (as well as a single specimen of *Kora rupestris*) were found in caves (SIMONE 2015), which are fragile ecosystems and thus face their own set of environmental problems (SIMONE 2013; CAMPOS-FILHO et al. 2014). A more thorough knowledge of this biome's species is of utmost importance for future conservation efforts.

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Taxonomical study on a sample of land snails from Nanuque (Minas Gerais, Brazil), with descriptions of three new species

Luiz Ricardo L. Simone & Rodrigo B. Salvador

Abstract

A sample of land snails was recently collected in a fragment of Atlantic rainforest, in the vicinities of the city of Nanuque (north of Minas Gerais state, Brazil), totaling 15 species. The following new species are herein described: *Leiostracus carnavalescus* **n. sp.** and *Rhinus botocudus* **n. sp.** (Bulimulidae), and *Obeliscus boitata* **n. sp.** (Subulinidae), the first two accompanied by anatomical descriptions. Moreover, the geographical ranges of some species are extended to Minas Gerais: *Auris bilabiata*, *Bahiensis* cf. *bahiensis*, *Cyclopomops moricandi*, *Dysopeas muibum*, *Helicina boettgeri*, *Helicina variabilis*, *Prohappia besckei*, and *Rectartemon piquetensis*. The discovery of new species in such a small forest fragment is a clear reminder of how little the Brazilian terrestrial snail fauna is known. It also points to the fact that these few remaining forest fragments may house many new and possibly endemic species and should, therefore, be properly preserved.

Keywords: Atlantic Forest, Caenogastropoda, Gastropoda, Neritimorpha, Pulmonata, Stylommatophora.

Zusammenfassung

Fünfzehn Arten Landschnecken wurden im Mai 2012 in einem atlantischen Regenwald-Fragment in der Umgebung der Stadt Nanuque im Norden des Bundesstaates Minas Gerais in Brasilien gesammelt. Die folgenden drei neuen Arten werden beschrieben: *Leiostracus carnavalescus* **n. sp.** und *Rhinus botocudus* **n. sp.** aus der Familie Bulimulidae sowie *Obeliscus boitata* **n. sp.** aus der Familie Subulinidae. In den ersteren beiden Beschreibungen werden auch ausführliche anatomische Merkmale berücksichtigt. Die folgenden Arten werden zum ersten Mal für Minas Gerais nachgewiesen: *Auris bilabiata*, *Bahiensis* cf. *bahiensis*, *Cyclopomops moricandi*, *Dysopeas muibum*, *Helicina boettgeri*, *Helicina variabilis*, *Prohappia besckei* und *Rectartemon piquetensis*. Die Entdeckung der drei für die Wissenschaft neuen Arten in dem kleinen Waldfragment ist ein deutlicher Hinweis darauf, wie gering die Kenntnis der brasilianischen Landschneckenfauna ist, und wie wichtig der Schutz auch kleiner Waldreste wäre, die viele neue und möglicherweise endemische Arten enthalten könnten.

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1 Introduction

The southeastern region of Brazil is historically the most explored (and exploited) in the country: its natural covering was fiercely degraded through the few centuries of the country's history. However, many new discoveries still wait in the remnants of Atlantic rainforest, especially regarding the scarcely studied terrestrial molluscan fauna. An expedition in May 2012 by shell collector José Coltro Jr. and his team to the previously unsampled region of Nanuque, in northern Minas Gerais state, recovered many land snails. Part of this material was donated to the collection of the Museu de Zoologia da Universidade de São Paulo (MZSP, São Paulo, Brazil) and is studied herein. As a testament to the incomplete knowledge of the Brazilian fauna, some of the animals recovered are new species. This paper presents formal descriptions of these taxa and extends the geographical distributions of some other previously known species.

Acknowledgements

We are deeply grateful to José Coltro Jr. (Femorale) for providing the material studied here; to Lara Guimarães (MZSP) for helping with SEM examination; to Barbara M. Tomotani (Netherlands Institute of Ecology, Wageningen, The Netherlands), Carlo M. Cunha (Academy of Natural Sciences of Philadelphia, USA) and Daniel Abbate (MZSP) for some of the photos used here (BMT: photos of *Leiostracus* from Mantena; CMC: photos of the living animals; DA: photos of *Helicina boettgeri* and *Bahiensis*).

2 Materials and methods

All the specimens collected are land snails, mainly stylommatophoran pulmonates, but two neritimorph species and one

caenogastropod are also present. Most species are only represented by dry shells, usually in a good state of preservation; only four were captured alive: *Helicina variabilis*, *Leiostracus perlucidus*, *Leiostracus carnavalescus* n. sp. and *Rhinus botocudus* n. sp. All the animals were collected in the vicinities of the city of Nanuque (17°50′51″S 40°22′47″W, ~120 m of elevation; Fig. 1), in the north of Minas Gerais state, very close to the borders with the states of Bahia and Espírito Santo. The locality is a very small fragment of Atlantic rainforest (area estimated at ca. 0.15 km²), close to the Mucuri River, surrounded by tomato crops and thus highly subject to anthropic action and degradation.

The animals collected alive were preserved in 70 % ethanol. Specimens were extracted from their shells and dissected (immersed in ethanol) by standard techniques under a stereomicroscope. Digital photographs were obtained for most dissection steps, as well as drawings with the aid of a camera lucida. Measurements were made with a digital caliper or with the Zeiss ZEN 2011 software. The radulae were mounted on stubs, coated with a gold-palladium alloy and examined by scanning electronic microscopy (SEM) in the Laboratório de Microscopia Eletronica of MZSP.

Identification was conducted based on the catalogue by Simone (2006), the original descriptions and additional material housed in the collection of the MZSP. Measurements were made with a digital caliper or with the aid of the Zeiss Axiovision SE64 Rel 4.8 imaging software. All specimens are deposited in the malacological collection of the MZSP. The list of examined material can be found together with the descriptions of the new species and, for the other species, on Tab. 1. Interestingly, specimens of the new *Leiostracus* species were found in the MZSP collection (from the municipalities of Mantena, Minas Gerais state, and Pinheiros and Sooretama, Espírito Santo state; Fig. 1) and were also included in the analysis.

Abbreviations

Shell measurements

D	shell greatest width (diameter)
d	aperture width
H	shell height
h	aperture height
S	spire height (excluding aperture)
S'	spire height (excluding body whorl)

Anatomical characters

aa	anterior aorta
ac	albumen chamber
ad	albumen gland duct

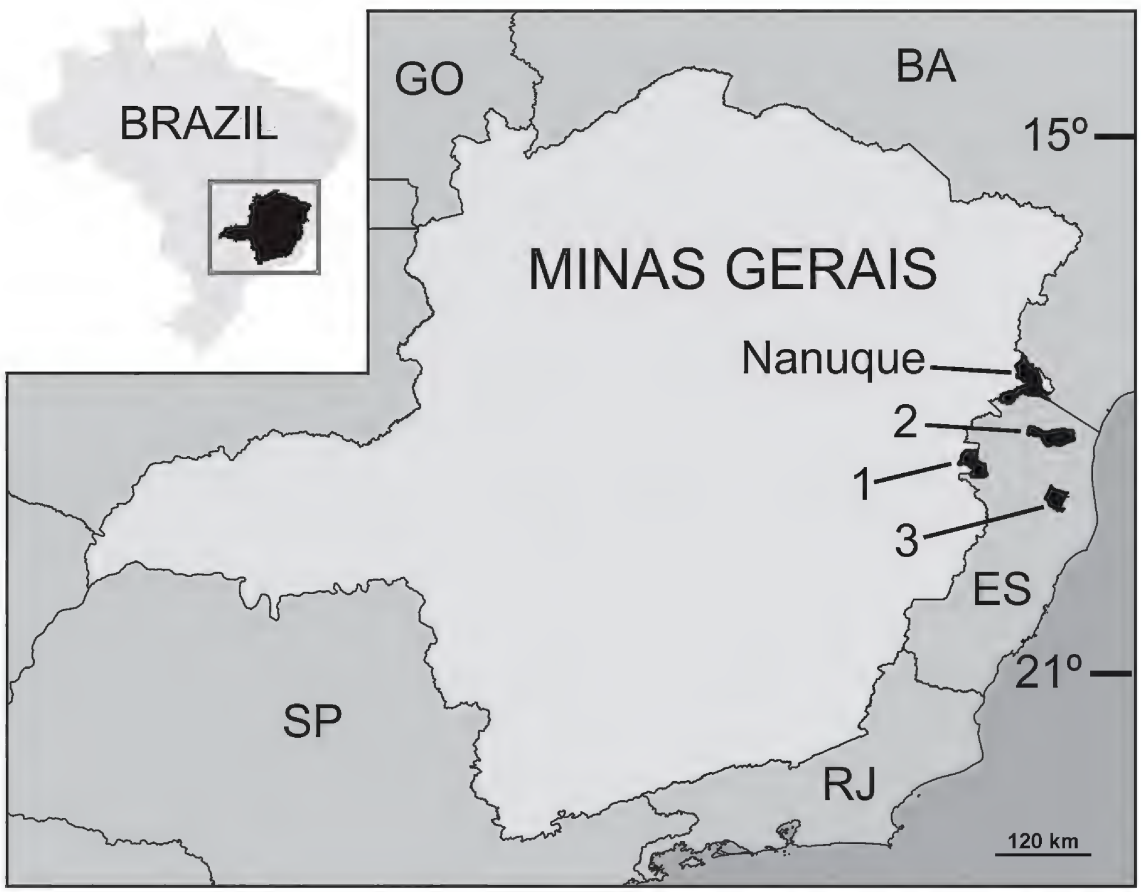


Fig. 1. Map showing the municipality of Nanuque, where the specimens studied here were collected, and the other municipalities from where the specimens of *Leiostracus carnavalescus* n. sp. come from: (1) Mantena; (2) Pinheiros; (3) Sooretama. – Abbreviations of the neighboring states: BA, Bahia; GO, Goiás; ES, Espírito Santo; RJ, Rio de Janeiro; SP, São Paulo.

Tab. 1. Other species occurring in the present material from Nanuque, accompanied by data on the material analyzed, mean measurements (of adult specimens) and previously known geographic distribution (sensu Morretes 1949, Simone 2006). *Record from Robinson & Slapcinsky (2005). – Abbreviations: Material: sh., shell; spc., specimen. Brazilian states: BA, Bahia; CE, Ceará; ES, Espírito Santo; MG, Minas Gerais; PB, Paraíba; PE, Pernambuco; RJ, Rio de Janeiro; RN, Rio Grande do Norte; SC, Santa Catarina; SE, Sergipe; SP, São Paulo.

Species	Family	Material (MZSP)	Measurements	Distribution
Auris bilabiata (Broderip & Sowerby, 1829)	Bulimulidae	106155 (2 sh.)	H = 41.7, D = 27.3	Brazil (SE, BA, ES, RJ)
Bulimulus tenuissimus (d'Orbigny, 1835)	Bulimulidae	106158 (13 sh.)	H = 18.1, D = 9.2	USA (introduced*), Suriname, Brazil, Bolivia, Uruguay
Leiostracus perlucidus (Spix, 1827)	Bulimulidae	106160 (9 sh.), 106161 (1 spc.)	H = 22.3, D = 11.6	Guyana, Suriname, Brazil
Helicina boettgeri Wagner, 1910	Helicinidae	106166 (1 sh.), 106167 (6 sh.)	H = 3.1, D = 4.1	Brazil (ES)
Helicina variabilis Wagner, 1827	Helicinidae	106171 (1 spc.), 106172 (4 spc.), 106173 (1 sh.)	H = 9.7, D = 12.4	Brazil (PB, BA, ES, RJ)
Cyclopomops moricandi (Pfeiffer, 1852)	Megalomastomidae	106168 (1 sh.)	H = 3.4, D = 5.1	Brazil (BA)
Bahiensis cf. *bahiensis* (Moricand, 1833)	Odontostomidae	106165 (1 sh.)	H = 16.2, D = 5.1	Brazil (BA, RJ)
Rectartemon piquetensis (Pilsbry, 1930)	Streptaxidae	106156 (9 sh.)	H = 20.3, D = 31.6	Brazil (BA, SP)
Megalobulimus bronni (Pfeiffer, 1847)	Strophocheilidae	106154 (1 sh.)	H = 91.3, D = 56.0	Brazil (MG, ES, SP)
Dysopeas muibum Marcus & Marcus, 1968	Subulinidae	106163 (1 sh.)	H = 5.7, D = 2.4	Brazil (SP)
Succinea meridionalis d'Orbigny, 1837	Succineidae	106162 (1 sh.)	H = 8.2, D = 4.9	Brazil (RJ) to Argentina (Patagonia)
Prohappia besckei (Dunker in Pfeiffer, 1847)	Systrophiidae	106164 (6 sh.)	H = 4.4, D = 7.1	Brazil (RJ, SC), Paraguay

ag	albumen gland
an	anus
ap	genital aperture
au	auricle
bc	bursa copulatrix
bd	bursa copulatrix duct
bg	buccal ganglia
bm	buccal mass
br	subradular membrane
ce	cerebral ganglion
cm	columellar muscle
cn	cerebro-pedal and cerebro-pleural connectives
co	collar vessel
cv	pulmonary (efferent) vein
cy	statocyst
da	digestive gland anterior lobe
dd	duct to digestive gland
df	dorsal folds of buccal mass
dg	digestive gland posterior lobe
di	diaphragm or pallial floor
eh	epiphallus
eo	spermoviduct
es	esophagus
ey	eye
fd	spermoviduct inner folds
ft	foot
ga	pedal gland aperture
gd	genital diverticulum
gf	gastric inner fold
go	gonad
hd	hermaphrodite duct
in	intestine
ir	insertion of m4 in subradular cartilage
jw	jaw
ki	kidney chamber
kl	kidney lobe
m1–m13	extrinsic and intrinsic odontophore muscles
mb	mantle border
mf	mantle fold
mj	jaw and peribuccal muscles
mo	mouth
mu	ommatophore retractor muscle
mx	platform of mj in median line
ne	nephrostome
nr	nerve ring
oc	odontophore cartilage
od	odontophore
of	odontophore cartilage median fusion with its pair
om	ommatophore
pa	posterior aorta
pc	pericardium
pe	penis
pf	penis inner folds
pg	pedal gland

pi	penis inner chamber
pm	penis muscle
pn	pneumostome
pp	pedal ganglion
ps	penis sheath
pt	prostate
pu	pulmonary cavity
pv	pneumostome right flap
ra	radula
rn	radular nucleus
rs	radular sac
rt	rectum
sa	salivary gland aperture
sc	subradular cartilage
sd	salivary gland duct
sg	salivary gland
sp	sperm groove
sr	seminal receptacle
st	stomach
su	subesophageal ganglion
tg	integument
tm	tentacle retractor muscle
to	tissue on radular ribbon preceding radular exposed region in buccal cavity
ua	ureter aperture
ug	urinary gutter
un	union of mantle border with nuchal surface
up	primary ureter
ur	secondary ureter
ut	uterus
vd	vas deferens
ve	ventricle
vf	spermoviduct inner fold preceding vas deferens aperture
vg	vagina

3 Systematics

Gastropoda
Pulmonata
Stylommatophora
Family Bulimulidae
Genus *Leiostracus* Albers, 1850

Leiostracus carnavalescus **n. sp.**
(Figs. 2–27, 53–67)

Type material

Holotype: MZSP 106177 (Figs. 53–58).

Paratypes: MZSP 106178 (14 specimens), 106179 (24 shells), from type locality. J. Coltro col., May/2012.

Type locality: Brazil. Minas Gerais: Nanuque, ~ 120 m of elevation (~ 17°51′S 40°23′W).

Additional material

Brazil. Minas Gerais: Mantena (city center coordinates: 18°46′55″S 40°58′48″W): MZSP 108010 (3 shells; Alex B. Bodart col., Feb/1993). – Espírito Santo: Pinheiros: Veado stream ("Córrego do Veado"): MZSP 106618 (4 specimens; Franklin N. Santos col., 29/May/2011). – Sooretama: Contorno road ("Estrada do Contorno"): MZSP 106920 (1 specimen; Franklin N. Santos col., 14/Apr/2012). – Sooretama: Jequitibá trail ("Trilha do Jequitibá"): MZSP 106666 (1 specimen; Franklin N. Santos col., 18/Jun/2012). – Sooretama: Quirininho trail ("Trilha do Quirininho"): MZSP 106650 (1 specimen; Franklin N. Santos col., 14/Apr/2012).

Etymology

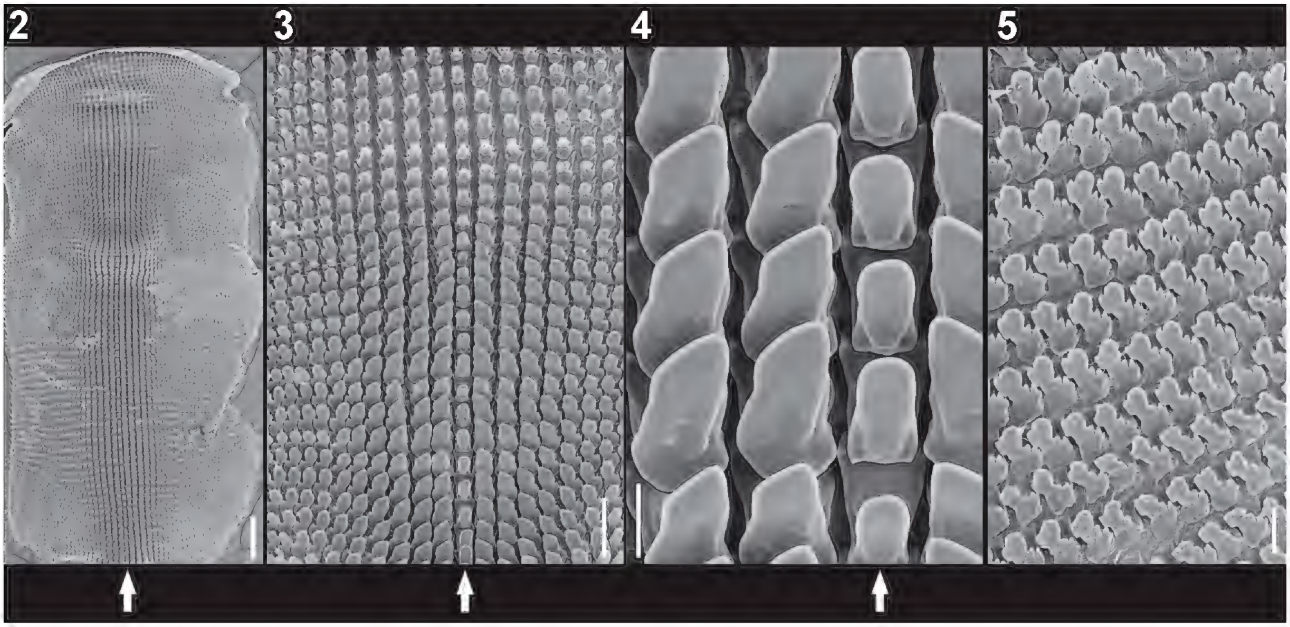
The name is a reference to the amazing variation in shell color in this species, establishing a parallel with the Carnival festival, when people dress in colorful costumes.

Diagnosis

Distinctive color pattern, with great intraspecific variation. Most usual color pattern is: spire top red, reddish orange or orange; spire with one broad spiral red or reddish brown band on middle portion of whorl, flanked by one or two lines of brownish dots; body whorl with dark brown or black spiral band on its base and red or light brown to dark brown spiral band close to the umbilicus.

Description

Shell (Figs. 53–65, 67): medium-sized (~ 25 mm), conical-oval; apex acuminated; greatest width on last whorl; width ~ ½ shell length. Base color white; color pattern with three main patterns (although some intraspecific variability can be found within these, mainly in color and thickness of the bands): (1) spire top red, reddish orange or orange; spire with one broad spiral red or reddish brown band on middle portion of whorl, flanked by one or two lines of brownish dots; body whorl with dark brown or black spiral band on its base and red or light brown to dark brown spiral band close to the umbilicus (Figs. 53–56, 59); (2) spire top orange; spire almost lacking white regions and with very thick orange spiral band on middle portion of whorl, flanked by lines of brownish dots; body whorl with many spiral bands below the orange one (from top to bottom: yellow band with the previously mentioned line of brownish dots superposed on it; dark brown or black band; another thick orange band; and, finally, a red band close to umbilicus) (Fig. 60); (3) spire top dark red to reddish brown; spire almost lacking white regions and with very thick spiral dark brown to black band and, below it, a single line of brownish dots; body whorl with greater white portion on its bottom, one dark brown or black spiral band on its base and another of same color close to umbilicus (Fig. 61). Spire angle ~ 40°. Protoconch of 1.5 whorl, sculptured by fine axial sinuous parallel riblets in upper portion and numerous fine spiral striae in lateral portion (Fig. 58); transition to teleoconch clear. Teleoconch smooth, except for growth lines. Whorl profile slightly convex. Suture well-marked. Aperture medium-sized, prosocline, oval; ~ 2/5 shell length, ~ 3/5 shell width. Peristome reflexed, especially on columellar region, partially covering umbilicus. Body whorl ~ ½ shell length. Umbilicus narrow.



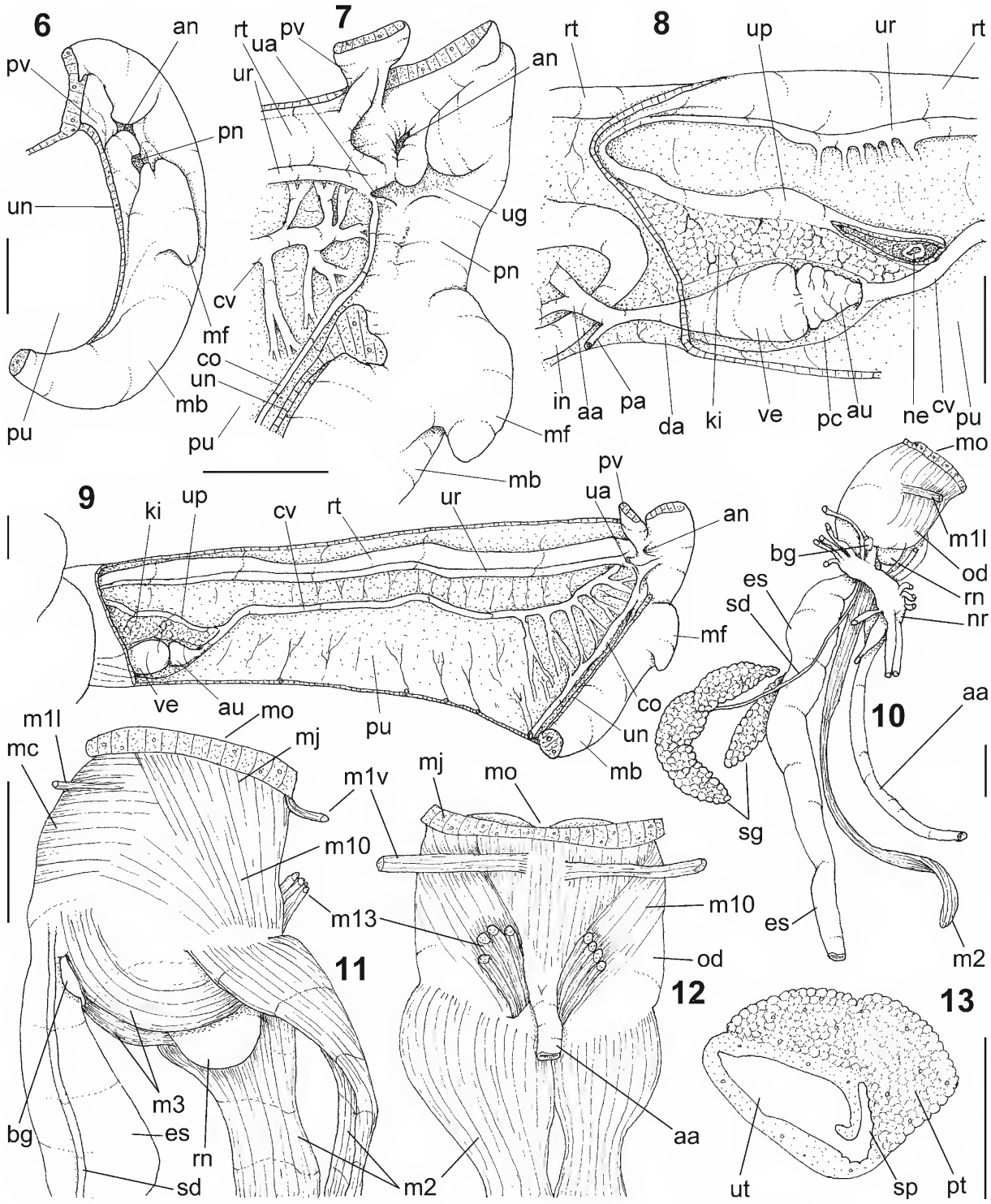
Figs. 2–5. *Leiostracus carnavalescus* n. sp., SEM images of radulae. The arrows indicate the rachidian column. – **2**. Whole view. **3**. Detail of central region. **4**. Greater detail of central region. **5**. Detail of lateral region. – Scale bars: 20 µm (4), 50 µm (5), 100 µm (3), 300 µm (2).

Head-foot (Figs. 14, 67): of normal shape. Color white, with a broad horizontal black band running continuously from frontal portion of head to middle portion of foot. Pair of ommatophores well-developed, with strong retractor muscles (tm). Eyes dark. Pair of tentacles brownish, with ~ ½ ommatophores' length. Columellar muscle thick, 2 whorls in length, divided into 5–6 separated bundles (Fig. 14: cm); originating in lateral regions of haemocoel and running along its ventral surface; bundles connecting with each other in insertion region on the columella.

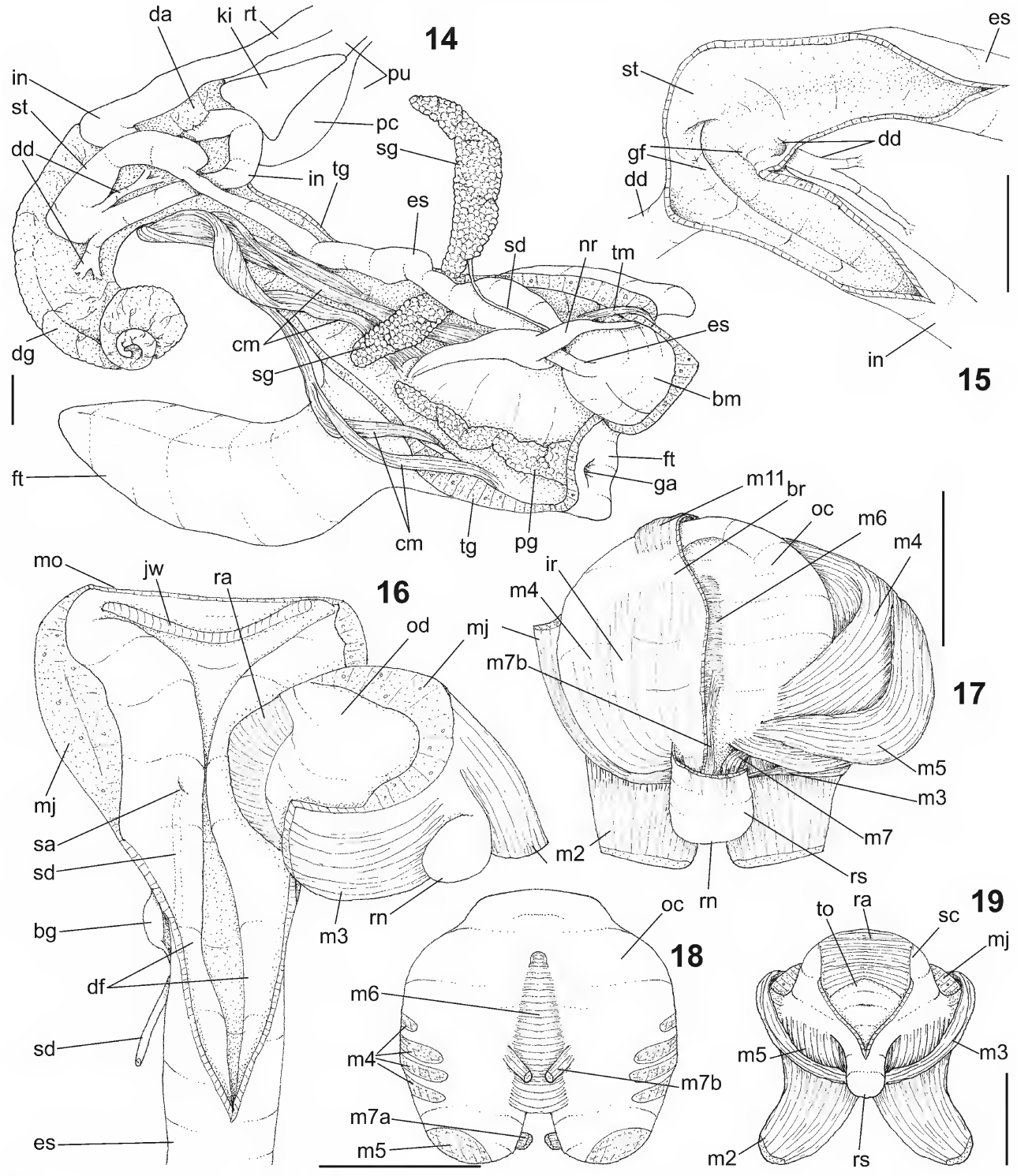
Mantle organs (Figs. 6–9): mantle border thick, lacking pigments. Pneumostome protected by ventral right flap (Figs. 6, 7: pv) with ~ ¼ of aperture length. Another similar-sized secondary fold is located on the left side of the pneumostome (Figs. 6, 7: mf). Pneumostome ~ 10 % of aperture length, bearing exclusively the air entrance and the urinary gutter (Fig. 7: ua, ug); anus is a separated aperture located on the right of the pneumostome (Fig. 7: an). Lung of 1.5 whorls in length, narrow and elongated. Pulmonary vessels conspicuous only in anterior quarter (Fig. 9); remaining regions almost smooth, with imbricated vessels of difficult visualization (Fig. 9: pu). Pulmonary vein (Figs. 8, 9: cv) running longitudinally between middle and right thirds of pallial cavity roof. Kidney beige, located posteriorly, occupying ~ 20 % of cavity length and ~ 50 % of its width (details below). Rectum (rt) and ureter (ur) narrow, running along right edge.

Visceral mass (Fig. 14): about 3.5 whorls in length. Both digestive gland lobes pale brown in color. Anterior lobe (Fig. 14: da) flattened, occupying ~ 1/6 of visceral volume, located just posteriorly to pallial cavity, continuous to kidney. Posterior lobe (dg) with 3 spiral whorls, occupying ~ 70 % of visceral volume. Stomach occupying ~ ⅛ of visceral volume, located between both digestive gland lobes, about half whorl posterior to pallial cavity (Fig. 14: st). Digestive tubes (described below) surrounding anterior lobe of digestive gland. Gonad clearly multilobed, cream colored, occupying entire second whorl, encased in middle-right region of posterior lobe of digestive gland, occupying ~ 1/15 of visceral volume.

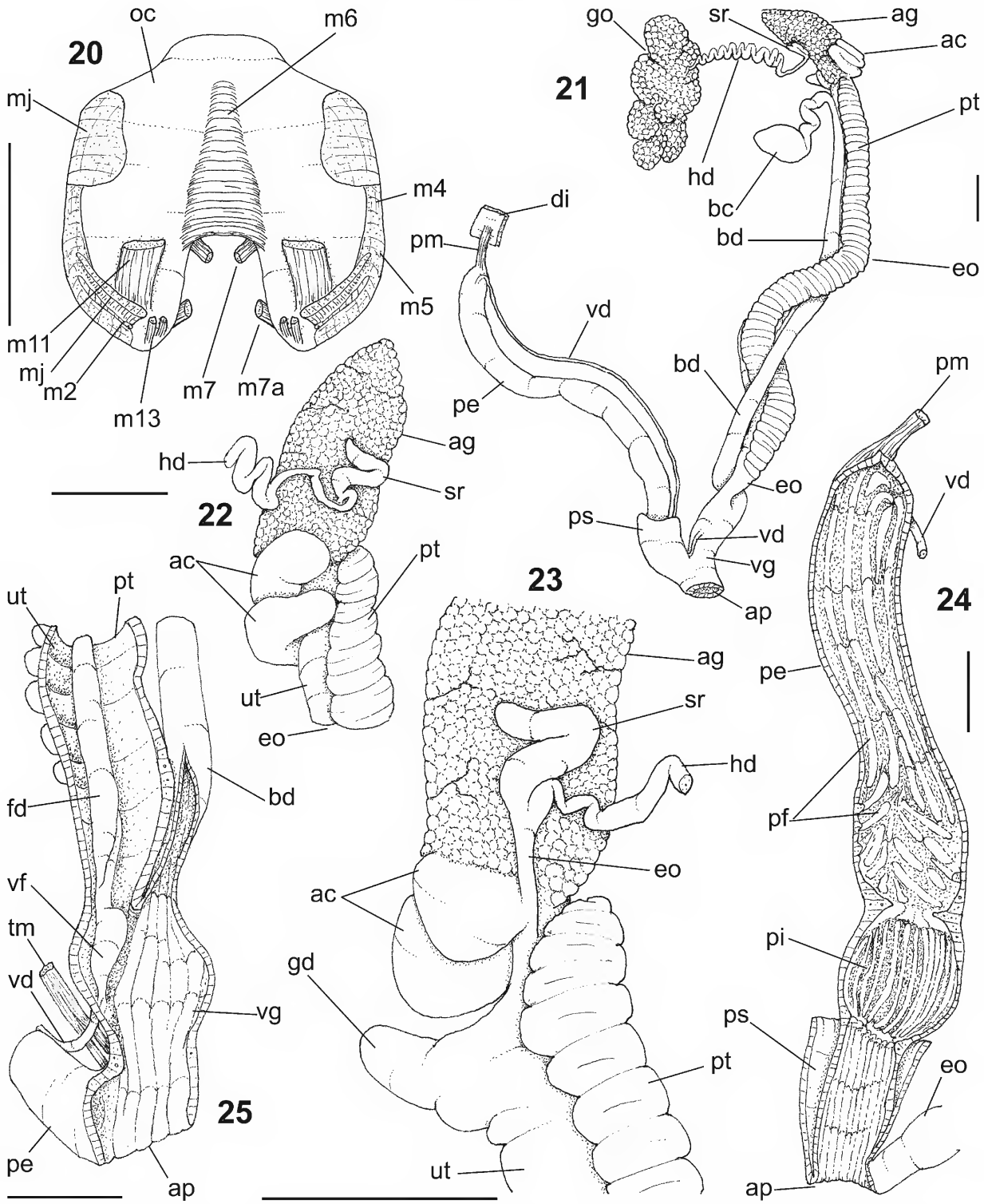
Circulatory and excretory systems (Figs. 8, 9): pericardium about twice as long as wide, located longitudinally between middle and left thirds of posterior end of pallial roof; occupying ~ 5 % of lung area. Auricle (au) located anteriorly, as a continuation of the pulmonary vein; slightly smaller than the ventricle (ve). Kidney (ki) simple, entirely solid, dorsoventrally flattened; size reported above. Nephrostome small, located on anterior-left corner as the tip of a small projection of renal tissue, turned to the right (Fig. 8: ne). Primary and secondary ureter complete, closed (tubular); primary ureter lying on right edge of kidney, towards the posterior and right region, after forming a strong curve; afterwards running anteriorly, as secondary ureter (ur), along entire left edge of rectum. Urinary aperture (Fig. 7: ua) simple, turned anteriorly, located on right edge of pneumostome. Urinary gutter (Fig. 7: ug) running in front of urinary aperture, almost perpendicularly to mantle border, gradually disappearing.



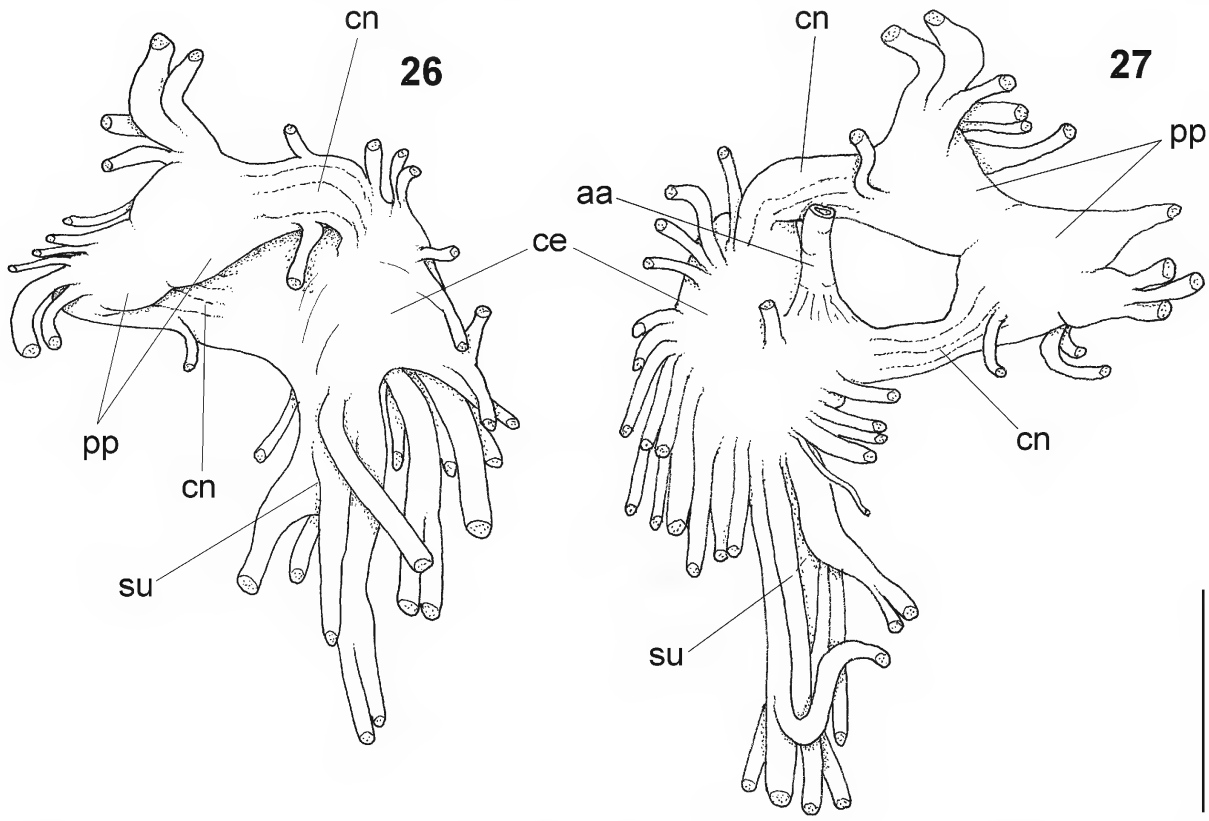
Figs. 6–13. *Leiostracus carnavalescus* n. sp., anatomy. – **6**. Detail of dorsal half of the mantle border, in frontal view. **7**. Pneumostome region, in ventral view (ventral wall deflected upwards). **8**. Reno-pericardial region, in ventral view (primary ureter opened longitudinally; the heart can be seen by transparency). **9**. Pallial cavity, in inner ventral view (ventral edge of pneumostome deflected). **10**. Foregut, in lateral (right) view (some of the more posterior structures were artificially separated from each other). **11**. Buccal mass, in lateral (right) view. **12**. Buccal mass, in ventral view. **13**. Spermoviduct, transverse section in its middle region. – Scale bars: 1 mm (13), 2 mm (6–12).



Figs. 14–19. *Leiostracus carnavalescus* n. sp., anatomy. –**14**. Dissected specimen, largely in lateral (right) view (haemocoel opened longitudinally and deflected; visceral mass partially uncoiled; pallial cavity structures only partially shown; genital organs completely removed). **15**. Stomach as seen in situ, in ventral view (ventral wall opened longitudinally). **16**. Buccal mass, in ventral view (odontophore partially removed and deflected). **17**. Odontophore, in dorsal view (the most superficial layer of muscles and membranes was removed; the left muscles were deflected to the right). **18**. Odontophore's cartilages, in ventral view, showing the insertion marks of some muscles. **19**. Odontophore, in dorsal view (radular sac partly opened longitudinally; m3 deflected downwards). – Scale bars: 2 mm.



Figs. 20–25. *Leiostracus carnavalescus* n. sp., anatomy. – **20**. Odontophore, in ventral view (most muscles removed, showing origins of intrinsic muscles in cartilages: oc). **21**. Isolated genital system, in complete dorsal view. **22**. Same, detail of albumen gland region (ag). **23**. Same, with base of albumen gland (ag) removed to show connection with spermoviduct. **24**. Penis opened longitudinally, showing inner surface in dorsal view (some of the adjacent structures are also shown). **25**. Anterior region of spermoviduct (up to genital pore), in dorsal view (greatly opened longitudinally to show inner surface; some of the adjacent structures are also shown). – Scale bars: 2 mm.



Figs. 26–27. *Leiostracus carnavalescus* n. sp., anatomy. – **26**. Central nervous system (nerve ring), in ventral view. **27**. Central nervous system (nerve ring), in dorsal view. – Scale bar: 1 mm.

Digestive system (Figs. 10–12, 14–20): oral tube short, with thick muscular walls (Figs. 11, 12, 16: mj). Jaw simple; exposed portion horseshoe-shaped, bearing several uniform transverse folds (Figs. 16: jw, 66); color beige, translucent. Buccal mass spherical, ~ 1/5 of haemocoel volume (Fig. 14: bm). Dorsal surface of oral cavity with well-developed pair of dorsal folds (Fig. 16: df). Odontophore ~ 3/5 of buccal mass volume (Fig. 12: od). Odontophore muscles (Figs. 10–12, 16–20): mj, jaw and peribuccal muscle originating on outer-ventral surface of odontophore cartilages (Fig. 20: mj), running towards dorsal region, splaying on dorsal wall of oral tube (Figs. 16–17, 19: mj); m1, jugal muscles entirely covering haemocoelic structures, more concentrated close to the mouth; m1v, small pair of ventral retractor jugal muscles originating on lateral surface of haemocoel, close to the mouth, running towards medial region, inserting in ventral region of oral tube, close to the median line (Figs. 11, 12: m1v); m1l, small pair of lateral retractor jugal muscles originating on dorso-lateral region of haemocoel, on the same level as oral tube, running dorso-ventrally, inserting in latero-dorsal surface of oral tube (Figs. 10, 11: m1l); m2, strong pair of retractor muscles of buccal mass (or radular muscles) originating as one pair of bundles of columellar muscle (Fig. 14: cm), running close to median line anteriorly along ~ 80 % of haemocoel length, inserting as two different bundles in ventroposterior edge of odontophore, surrounding radular nucleus (Figs. 10, 16–17, 19–20: m2), passing through nerve ring (Fig. 10: nr); m3, transverse muscle of the posterior region of odontophore connecting both laterodorsal sides of odontophore, passing through odontophore posterior surface, in front of radular nucleus (Figs. 11, 16–17, 19: m3); m4, main pair of very thick dorsal tensor muscles of radula originating on posteromedial region of odontophore cartilages, in 3–4 oblique layers (Figs. 17–18: m4), surrounding the cartilages, inserting in subradular membrane (Fig. 17: ir); m5, pair of thick auxiliary dorsal tensor muscles originating on posteroventral region of odontophore cartilages (Fig. 18: m5), along ~ 10 % of their length, running towards median line, inserting in subradular membrane by side of m4 insertion; m6, horizontal muscle thin, located between both cartilages in region just posterior to their fusion, along ~ 2/5 cartilages length, keeping free ~ 1/6 of cartilages length posterior to it (Figs. 17–18, 20: m6); m7, small pair of muscles originating in middle level of cartilages central edge, just posterior to m6 (Fig. 20: m7),

running medial-posteriorly inside radular sac, inserting splaying in dorsal posterior inner surface of radular sac (Fig. 17: m7); m7a, small pair of muscles of similar character as m7, but originating in posterior-medial corner of radular cartilages (Figs. 18, 20: m7a), running ventrally; m7b, small pair of narrow muscles originating in middle level of ventral edge of odontophore cartilages, covering m6, running posteriorly close to median line, inserting in dorsal inner surface of radular sac (Figs. 17–18: m7b); m11, pair of wide ventral tensor muscles of radula originating on ventrolateral surface of posterior region of cartilages (Fig. 20: m11), running close to the cartilages towards anterior region, inserting in ventral end of subradular membrane (br) (Fig. 17: m11); m13, pair of strong ventral odontophore protractor muscles originating on anteroventral region of haemocoel, running briefly towards dorsal region (Figs. 11, 12: m13), penetrating odontophore structures by lateral aorta insertion, inserting in outer-posterior surface of odontophore cartilages (Fig. 20: m13). Odontophore non-muscular structures (Figs. 17–20): oc, odontophore cartilages flattened, elliptical, circa three times longer than wide, fused with each other for ~ ¼ of their anterior end (Figs. 18, 20: oc); anterior end roughly rounded; anterior region slightly curved medially; sc, subradular cartilage, with expanding region in buccal cavity protecting subradular membrane (Fig. 19: sc). Radular sac short, slightly extending beyond odontophore (Figs. 17, 19: rs).

Radula (Figs. 2–5) ~ 50 % longer than odontophore; with rachidian teeth, and ~ 30 pairs of lateral teeth; no clear distinction between lateral and marginal teeth (Fig. 2). Rachidian tooth (Figs. 3–4: arrow) small, ~ 1/70 of radular width and roughly twice longer than wide; base wider, barely triangular; cutting edge slightly rounded, with ~ 80 % of base length and 95 % of base width. Lateral teeth similar to rachidian (Figs. 3–4), except in being slightly asymmetrical, weakly arched towards median region, and with cutting edge circa twice the size of rachidian's. Lateral teeth gradually decreasing towards lateral region; third or fourth teeth with gradually appearing basal-lateral cusp that becomes more and more distinct in more marginal teeth. Marginal teeth starts with no clear boundary with lateral teeth; shaped similarly to lateral teeth, except for being smaller and with a proportionally larger secondary cusp. There are more marginal teeth showing a bifid basal cusp (Fig. 5). Each radular row is disposed linearly on the same level (Fig. 2).

Salivary glands covering middle third of esophagus (Fig. 14: sg), forming two elongated white thin masses. Each salivary duct differentiable on anterior region of glands, with about 5–8 % esophageal width. Salivary duct running on both sides of esophageal origin (Figs. 10, 14: sd), penetrating buccal mass wall on the region close to buccal ganglia (Fig. 16: sd). Salivary ducts opening on anterior middle level of dorsal folds, slightly separated from median line (Fig. 16: sa).

Esophagus one whorl long, with thin flaccid walls lacking clear subdivisions (Figs. 10–11, 14: es); inner surface simple, smooth. Posterior esophageal half slightly narrower than anterior half. Stomach (Fig. 14: st) relatively narrow, curved, somewhat fusiform; position and size described above (visceral mass); gastric walls thin, flaccid; inner surface smooth (Fig. 15), except for narrow longitudinal fold (gf) from small gastric concavity up to intestinal origin, disappearing gradually. Esophageal insertion on right side, marked by sudden increase in size; intestinal origin on left side; both close to columella. Duct to anterior lobe of digestive gland encased between esophagus and intestine (Fig. 14: dd). Duct to posterior lobe of digestive gland located a short distance from intestinal origin and posteriorly to the above-described duct, directed towards the opposite side (Fig. 14: dd). Intestine as wide as esophageal insertion along its entire length, flanking the left side of the anterior lobe of digestive gland; on the region of the kidney, it gradually turns right and anteriorly, running almost straightly forward in the pallial cavity (Fig. 14: in). Rectum and anus described above (pallial cavity; Fig. 7).

Genital system (Figs. 21–25): gonad described above (visceral mass). Hermaphroditic duct (Fig. 11: hd) narrow and weakly coiled; running for ~ ¼ whorl close to columella. Seminal receptacle (Figs. 22–23: sr) elongated, sac-like, strongly curved, with circa three times the hermaphroditic duct width, and ~ 10 % its length. Fertilization complex simple, located on the base of seminal receptacle (Fig. 23) as a continuation of the hermaphroditic duct and the seminal receptacle's duct; ~ ½ width and length of receptacle. Fertilization complex totally immersed in albumen gland (Fig. 22), inserting in the posterior end of spermoviduct, in the albumen gland duct's region; all of them of similar width. Albumen gland (Figs. 21–23: ag) solid, white, elliptical, as large as gonad (~ 1/6 whorl). Albumen gland duct subterminal, connected to distal end of spermoviduct, preceded by pair of large albumen chambers (Figs. 21–23: ac), each with ~ ¼ albumen gland size, located on dorsal region of transition between albumen gland and spermoviduct, successively connected to the beginning of spermoviduct (Fig. 23). Spermoviduct ~ 1.5 whorl in length, slightly narrower than albumen gland, ~ 20 times longer than wide. Prostate gland occupying ~ ½ of the spermoviduct volume (Fig. 23: pt). Uterus occupying the other half of spermoviduct volume; external walls thick-glandular (Fig. 23: ut); inner surface completely covered by ample transversal folds (Fig. 25: ut); posterior diverticulum well-developed on the region immediately anterior to the albumen chambers (Fig. 23: gd). Sperm grove simple in posterior two thirds of spermoviduct (Fig. 13: sp), protected ventrally by a tall fold; gradually becoming tubular fold (Fig. 25: fd) as

vas deferens, along anterior third of spermoviduct, with ~1/5 of anterior spermoviduct width; bearing clear swelling (Fig. 25: vf) on region preceding exteriorization of vas deferens (Figs. 21, 25: vd). Vagina ~1/10 of spermoviduct length; inner surface simple, with 4–5 longitudinal, low, wide folds (Fig. 25: vg). Bursa copulatrix as long as spermoviduct plus albumen gland; bursa duct as wide as adjacent spermoviduct on its origin but gradually narrowing towards posterior end (Figs. 21, 25: bd); bursa elliptical, ~⅓ of albumen gland size (Fig. 21: bc), located encased between pericardium and adjacent intestinal loop. Penis ~4/5 of spermoviduct length, ~⅔ its anterior width (Fig. 21: pe); penis muscle inserting terminally, very short (Fig. 21: pm). No epiphallus. Vas deferens inserted subterminally in penis tip (Figs. 21, 24: vd). Internal penial surface with 3 clear sub-chambers (Fig. 24): posterior subchamber with ~½ penis length, bearing 4–5 longitudinal narrow low well-separated folds, some of them converging to the vas deferens aperture (vd), anterior quarter with fold becoming oblique and interrupted (pf); middle subchamber (pi) separated from other sub-chambers by transverse constrictions (posterior constriction slightly taller than anterior one), with ~¼ penis length, internal surface bearing 10–12 longitudinal narrow closely-packed folds; anterior sub-chamber narrow, with ~¼ of penis length, bearing 10–12 inner longitudinal low closely-packed folds. Penis shield with same length as anterior penial subchamber (Fig. 24: ps). Genital pore round, simple.

Central nervous system (Figs. 26–27): located dorsally from ventral base of buccal mass up to the transition between buccal mass and esophagus (Figs. 10, 14: nr). Pair of cerebral ganglia (ce) largely fused with each other; cerebral commissure invisible; each ganglion about as wide as adjacent esophageal section; several wide nerves originating on cerebral anterior edge, including relatively narrow subesophageal ganglion (su) located close to cerebral ganglia (but not fused with it). Pair of optical ganglia not individualized, possibly part of other nerves. Four parallel connectives (cn) between cerebral ganglia and pedal ganglia. Pair of pedal ganglia (pp) forming a single mass located opposite to the cerebral ganglia, slightly smaller in size than the latter. No differentiable ganglion detectable except for medial weak constriction. Several pairs of pedal nerves originating from latero-anterior corner of these ganglia. Anterior aorta (aa) clearly inserted in anteroventral region between both cerebral ganglia. Pair of statocysts not seen.

Measurements (in mm). Holotype: 8 whorls; H = 25.4; D = 12.4; S = 16.9; S' = 13.4; h = 9.2; d = 8.1. Mean (n = 17): 7 to 8 whorls; H = 24.4 ± 1.3 (max 26.6; min 22.8); D = 13.1 ± 0.9 (max 16.0; min 12.1); S = 14.9 ± 0.9 (max 16.9; min 13.6); S' = 11.7 ± 0.9 (max 13.4; min 10.4); h = 10.0 ± 0.8 (max 12.1; min 8.9); d = 7.6 ± 0.4 (max 8.3; min 6.9).

Distribution

Brazil. Minas Gerais: Nanuque (type locality) and Mantena municipalities. Espírito Santo: Pinheiros and Sooretama municipalities.

Habitat

Found on trees or tall bushes in Nanuque. Specimens from Mantena were found on subshrubs; specimens from Espírito Santo state have no habitat data. It is unknown whether its remarkable color pattern is related to camouflage, aposematism, or if it indeed plays some role on the animal's life at all. Still, it should be noticed that many specimens show signs of predation by birds.

Remarks

Leiostracus carnavalescus n. sp. bears some resemblance to *L. obliquus* (Reeve, 1849), from Bahia and Minas Gerais states (Simone 2006); however, it has a much thinner shell, a much less reflected peristome, wider and more conical shell, and the remarkable and variable color pattern (see description above). Shells with variable color pattern are not uncommon in the genus, but usually comprise only varying tones of yellow and brown (e. g., Simone 2006, Salvador & Cavallari 2013). The species which more closely resembles the pattern of *L. carnavalescus* is *L. vittatus* (Spix, 1827): it is white with one to three spiral brownish bands and some specimens show an "inverted" color pattern (base color brown with white spiral bands); moreover, it occurs in the states of Pernambuco and Bahia (Simone 2006), a neighboring distribution in relation to *L. carnavalescus*. Still, *L. carnavalescus* can be easily distinguished by its wider and more conical shell, with a smaller and rounder aperture.

The specimens from the municipality of Mantena (Fig. 1), approximately 130 km to the south of Nanuque, seem to belong to the same species as far as the conchological characters indicate. However, slight differences in coloration are evident (Figs. 64–65), although their importance cannot be evaluated without additional material. The specimens from Mantena are white with only two spiral bands on the body whorl (one red and the other, close to the umbilicus, dark brown), have an yellowish brown spire top and have only a single line of yellowish brown dots on their spire (these dots can be very large in some instances: Fig. 64). Moreover, in one specimen (Fig. 64), the suture line is marked with a brown line. Finally, while the animals from Nanuque were found on trees or tall bushes, the ones from Mantena were supposedly found on subshrubs, at least according to the specimens' labels.

The specimens from Espírito Santo state (Figs. 62–63), on the other hand, present a color pattern extremely similar to the type material from Nanuque; the single exception is that these specimens lack the spiral line of dots, having

a solid line instead. The municipality of Pinheiros is circa 65 km to the southeast of Nanuque, while the municipality of Sooretama is circa 150 km to the southeast (Fig. 1). Unfortunately, these specimens have no habitat data.

Anatomically, *L. carnavalescus* has the normal pattern of the Bulimulinae (Breure & Schouten 1985; Simone 1998). The more remarkable features are the multiplicity of the columellar muscle bundles (Fig. 14: cm); the enlargement of the pedal gland (Fig. 14: pg); the multiplicity of the pair of odontophore muscles m7 (inside radular sac: m7, m7a, m7b; Figs. 17–18, 20); the pair of ventral protractor muscles of odontophore (Figs. 11, 12: m13); the two albumen chambers (Fig. 22: ac); the simplicity of the fertilization chamber (Fig. 23); and the penis divided into 3 sub-chambers (Fig. 24). The significance of these differences, in species, genus and family levels, is still under analysis.

Genus *Rhinus* Martens in Albers, 1860

Rhinus botocudus **n. sp.**
(Figs. 28–52, 68–76)

Type material

Holotype: MZSP 106174 (Figs. 68–73).

Paratypes: MZSP 106175 (2 specimens), 106176 (10 shells), from type locality. J. Coltro col., May/2012.

Type locality: Brazil. Minas Gerais; Nanuque, ~120 m of elevation (~17°51'S 40°23'W).

Etymology

Reference to the "Botocudos" native Indians who once dwelt in the region.

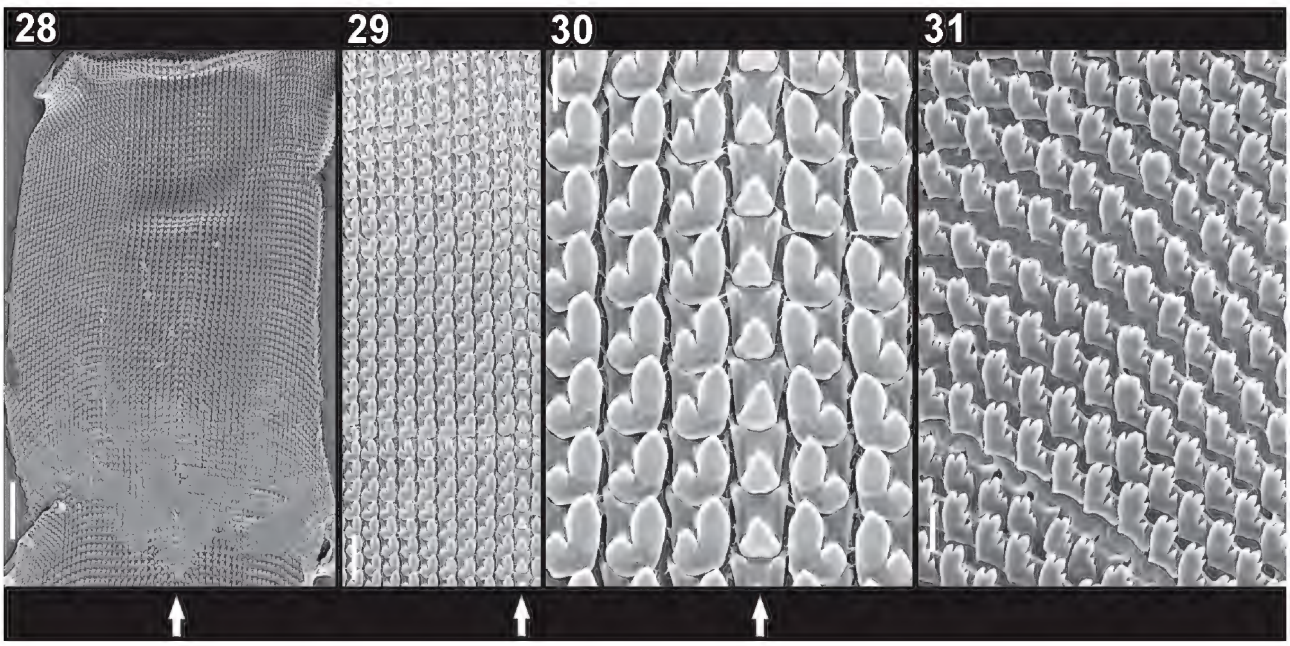
Diagnosis

Shell small and globose; aperture large and elongated diagonally. Protoconch with different sculpture patterns on upper and lateral portions of the whorl. Whitish spiral line running on the middle portion of body whorl.

Description

Shell (Figs. 68–74): medium-sized, ovoid to globose; diameter ~¾ shell length. Color yellowish brown to light brown, with whitish spiral line on middle portion of body whorl (Fig. 68). Spire angle ~75°. Protoconch of 1.5 whorl, sculptured by axial parallel riblets on upper portion of whorl and spiral parallel striae on lateral portion of whorl (Fig. 72); transition to teleoconch clear, orthocline. Teleoconch smooth, except for growth lines, with lightly hairy periostracum; hairs arranged in spiral parallel lines, ~45 on body whorl, uniformly spaced and distributed (Fig. 73). Whorl profile convex. Suture well-marked. Aperture large, oval, diagonally elongated, slightly prosocline; ~⅗ shell length, ~⅔ shell width. Peristome slightly reflexed, more reflexed on columellar region, partially covering umbilicus. Body whorl ~¾ shell length. Umbilicus narrow.

Head-foot (Figs. 37, 38, 74): features similar to *Leiostracus carnavalescus* (see above), with the following



Figs. 28–31. *Rhinus botocudus* n. sp., SEM images of radulae. The arrows indicate the rachidian column. – **28**. Whole view. **29**. Detail of central region. **30**. Greater detail of central region. **31**. Detail of marginal region. – Scale bars: 20 µm (30, 31), 50 µm (29), 200 µm (28).

differences: Color uniformly dark grey on exposed areas (Fig. 74). Pair of ommatophores retractor muscles elongated, originating from columellar muscle (Fig. 37: mu). Columellar muscle of 1.5 whorl in length, divided into 4–5 separated bundles (Figs. 37–38: cm).

Mantle organs (Figs. 32–35): features similar to *Leiostracus carnavalescus* (see above), with the following differences: Mantle border thick and very tall (Fig. 32: mb). Secondary fold of mantle border located on bottom side of mantle collar (Figs. 32–33: mf). Outer pneumostome fold with circa twice the length of inner fold. Anus is a separated aperture located to the right of the pneumostome (Figs. 32, 34: an). Lung relatively wide. Anterior three quarters of pulmonary vessels conspicuous (Fig. 32); posterior quarter nearly smooth; venation absent on the region close to pneumostome (Fig. 34). Kidney occupying ~ 30 % of cavity length and ~ 50 % of its width.

Visceral mass (Fig. 39): features similar to *Leiostracus carnavalescus* (see above), with the following differences: Visceral mass ~ 2.5 whorls in length; stomach ~ 1/6 of visceral volume (Fig. 39: st).

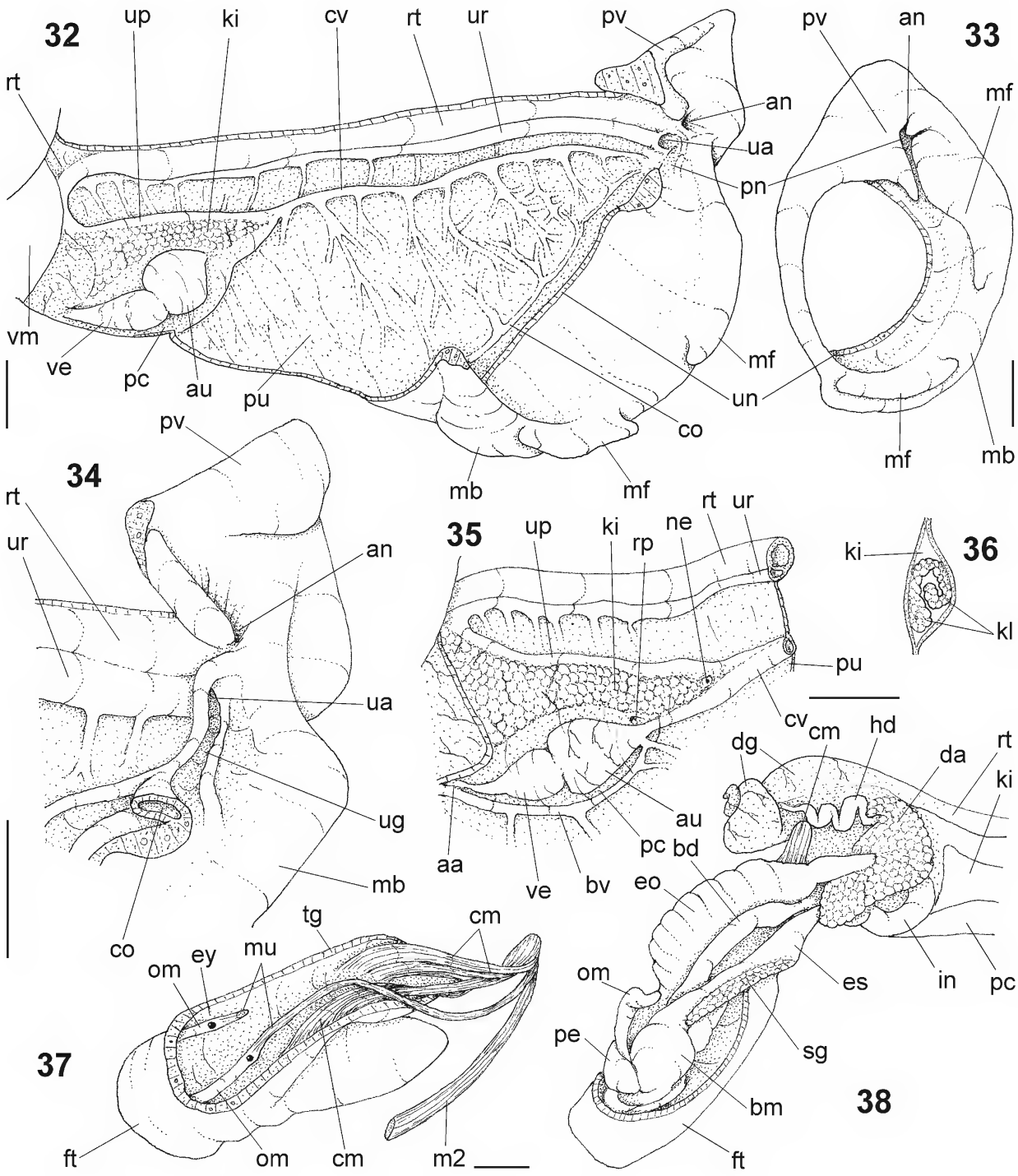
Circulatory and excretory systems (Figs. 32–35): features similar to *Leiostracus carnavalescus* (see above), with the following differences: Pericardium occupying ~ 10 % of lung area. Kidney with coiled kidney lobe ("roulade-like"; Fig. 36: kl). Nephropore punctiform, located on anterior-left corner (Fig. 35: ne). Urinary aperture wide (Fig. 32: ua). Urinary gutter well-delimited by pair of folds, running parallel to mantel border (Fig. 34: ug).

Digestive system (Figs. 38–45): features similar to *Leiostracus carnavalescus* (see above), with the following differences: Jaw with constant width along its length, bearing fewer transverse folds; median folds more perpendicular to edges (Figs. 40: jw, 75–76); color yellow, translucent. Buccal mass occupying ~ 1/6 of haemocoel volume (Fig. 38: bm). Pair of dorsal folds or oral cavity slightly narrower (Fig. 40: df). Salivary apertures (sa) located slightly more posteriorly. Differences in odontophore muscles (Figs. 40–45): mj, origin more elongated and posteriorly located (Fig. 45: mj); m1v and m1l pairs undetectable; m1d, pair of small dorsal protractor muscles (Fig. 41: m1d) originating on dorsal peribuccal inner surface of haemocoel, running to posterior region flanking buccal mass and inserting in posterior-dorsal surface of buccal mass; m2, slightly narrower near insertion (Figs. 42–43: m2), inserting in m4 instead of cartilages; m3, narrower (Fig. 40: m3); m3p, pair of thin and narrow muscles with dorsoventral fibers connecting lateral region of esophageal origin with ventral region of m2 insertion (Figs. 40–41: m3p); m4, slightly thicker (Figs. 42–43: m4); m5, shorter and thinner (Fig. 43: m5); m6, narrower on posterior region (Figs. 43, 45: m6); m7, m7a and m7b undetectable; m11, originating more anteriorly, narrower near origin (Fig. 45: m11); m13, slightly thicker near origin (Fig. 45: m13), but quickly narrowing (Figs. 41–42: m13); mx, strong thick muscular layer produced medially by mj pair, passing posteriorly to both odontophore cartilages (Fig. 42: mx). Differences in odontophore's non-muscular structures (Figs. 42–45): odontophore cartilages' anterior junction slightly more pointed (Fig. 43: oc), fused with each other along ~ 1/5 of their length, on their anterior end (Figs. 44–45: of).

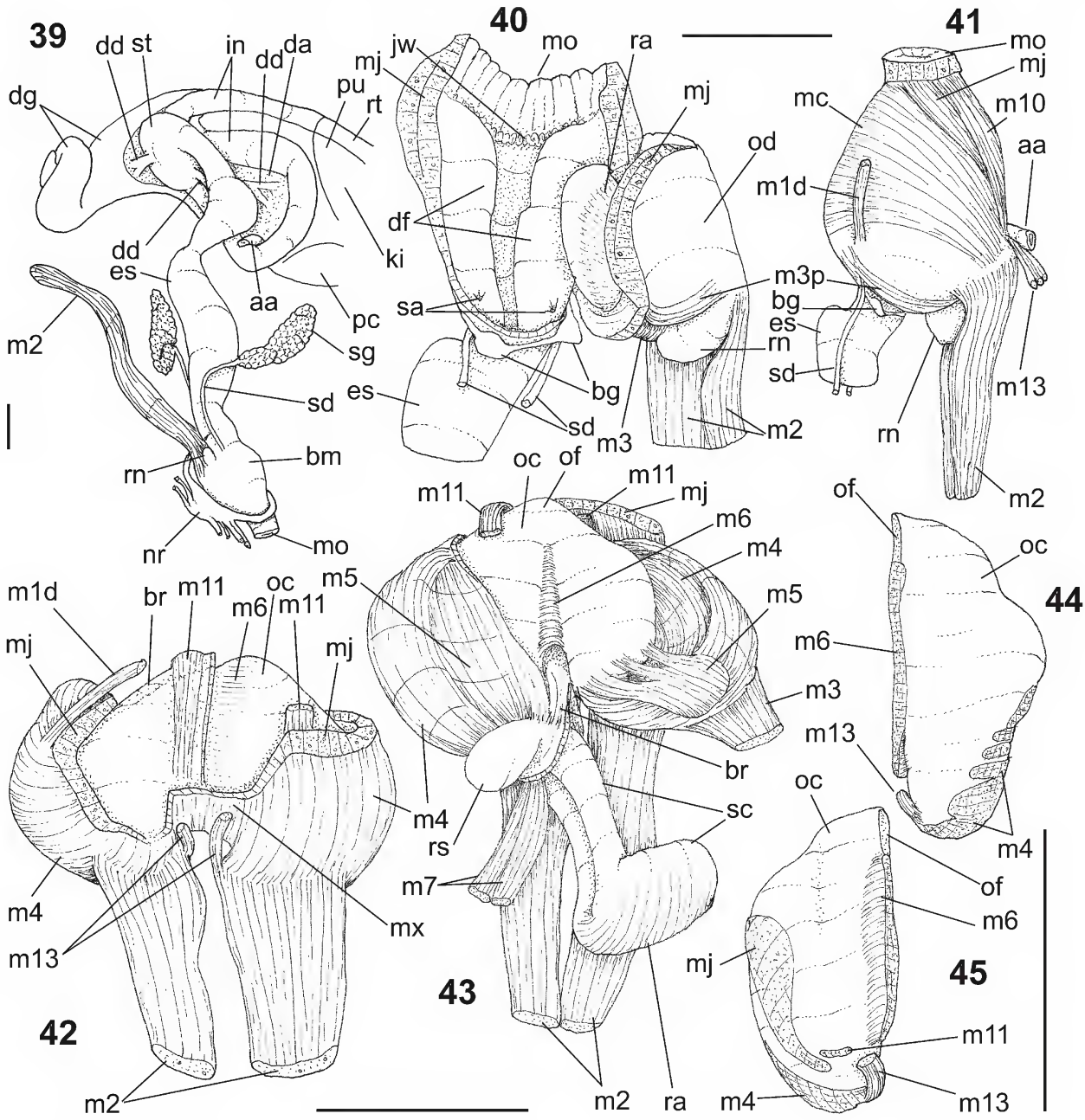
Differences in radula (Figs. 28–31): ~ 40 pairs of lateral teeth; distinction between lateral and marginal teeth somewhat clear, marked by abrupt inclination of tooth row (Fig. 28). Rachidian tooth (Figs. 29–30: arrow) ~ 1/80 of radular width and circa twice longer than wide; base with circa twice the length of cutting edge; cutting edge somewhat triangular, pointed. Lateral teeth (Figs. 29–30) always with secondary lateral cusp (of ~ ½ main medial cusp size); ~ 10 pairs of lateral teeth per row. Marginal teeth with 2–3 small secondary cusps on main cusp; basal cusp small, slightly bifid (Fig. 31).

Esophagus lacking clear subdivisions along its length (Fig. 39: es); lacking duct to anterior lobe of digestive gland. Stomach (Fig. 39: st) spherical; gastric walls thin; inner surface bearing uniform cover of narrow longitudinal folds. Duct to anterior lobe of digestive gland encased between esophagus and intestine, opening directly into anterior region of stomach (Fig. 39: dd). Duct to posterior region located on the middle of posterior gastric surface.

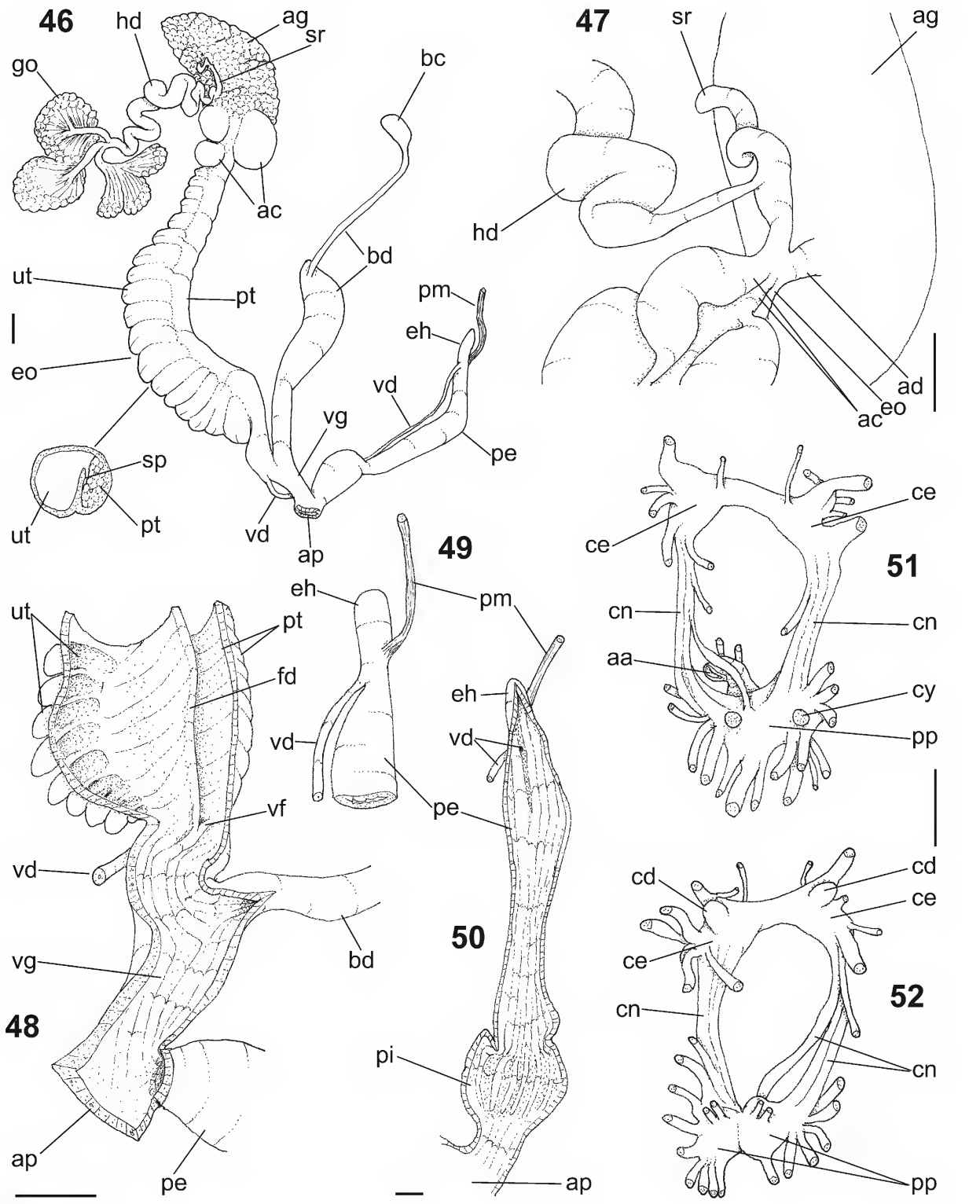
Genital system (Figs. 46–50): features similar to *Leiostracus carnavalescus* (see above), with the following differences: Gonad with more distinct lobes (Fig. 46: go). Hermaphroditic duct shorter, less coiled and much thicker (Figs. 38, 46: hd). Insertion of hermaphroditic duct very narrow (Fig. 47: hd). Seminal receptacle narrower, coiled, ~ 10 times longer than wide (Fig. 47: sr). Fertilization complex about as wide as seminal receptacle and ~ ½ its length; anterior end of complex with wide albumen gland duct and pair of albumen chamber ducts on opposite side (Fig. 47: ad, ac). Albumen chambers (Figs. 46–47: ac) each of ~ 1/6 albumen gland size; the most posteriorly located chamber is duplicated. Spermoviduct slightly shorter and broader, of ~ 1 whorl in length, ~ 12 times longer than wide. Prostate gland occupying ~ ⅓ of spermoviduct volume (Fig. 46: pt). Uterus occupying other ⅔ of spermoviduct space; external walls with strong transverse folds (Fig. 46: ut); no posterior diverticulum (Fig. 47). Sperm grove is a tall fold on almost the entirety its length (Figs. 46, 48: fd); vas deferens exteriorization simple, connected to internal fold (Fig. 48: vf). Bursa copulatrix as long as spermoviduct; bursa duct as wide as adjacent spermoviduct near its origin, but gradually narrowing towards posterior end (Figs. 46, 48: bd), up to ~ 1/5 spermoviduct width; bursa with ~ 1/5 of albumen gland size (Fig. 46: bc); one specimen with bulging due to fusiform, elongated spermatophore (Fig. 46: bd). Penis ~ ½ spermoviduct length (Figs. 38, 46: pe); penis muscle short, inserting



Figs. 32–38. *Rhinus botocudus* n. sp., anatomy. **32**. Pallial cavity, in inner ventral view (ventral flap of pneumostome [pv] deflected). **33**. Mantle border, in frontal view (as in situ). **34**. Detail of pneumostome region, in ventral view (ventral flap of pneumostome [pv] deflected upwards). **35**. Posterior region of pallial cavity, in inner ventral view (heart and reno-pericardial apertures seen by transparency). **36**. Transverse section of the middle level of kidney (ventral side to the right). **37**. Head-foot, in dorsal view (most of the dorsal side of haemocoel removed to show columellar muscle components). **38**. Head-foot and visceral mass, mostly in ventral view (dorsal wall of haemocoel removed; pallial cavity partially shown; most structures seen as in situ). – Scale bars: 2 mm.



Figs. 39–45. *Rhinus botocudus* n. sp., anatomy. – **39**. Foregut and midgut, in dorsal view (some adjacent structures are also shown). **40**. Buccal mass, in ventral view (odontophore partially removed and deflected to the right). **41**. Buccal mass, in lateral (right) view. **42**. Odontophore, in ventral view (right intrinsic muscles deflected; part of subradular membrane [br] removed on the right side). **43**. Odontophore, in dorsal view (radula still partially connected, but deflected downwards). **44**. Right odontophore cartilage, in dorsal view, showing origin of the intrinsic muscles. **45**. Right odontophore cartilage, in ventral view. – Scale bars: 2 mm.



Figs. 46–52. *Rhinus botocudus* n. sp., anatomy. – **46**. Genital system, in ventral view (with cross-section of indicated portion of spermoviduct). **47**. Genital system, detail of region of carrefour (albumen gland [ag] seen as transparent structure). **48**. Terminal region of genital system, in dorsal view (most of the female portion opened longitudinally). **49**. Penis, detail of distal region. **50**. Penis, in dorsal view, entirely opened longitudinally. **51**. Central nervous system (nerve ring), in ventral view. **52**. Central nervous system (nerve ring), in dorsal view. – Scale bars: 1 mm.

subterminally (Figs. 49–50: pm). Epiphallus is a simple blind sac, ~⅛ penis length (Figs. 49–50: eh). Vas deferens inserted between epiphallus and penis (Figs. 49–50: vd). Internal penial surface lacking clear inner divisions, except for anterior wide short region (Fig. 50: pi); 5–6 longitudinal simple wide folds, closely packed together, but gradually becoming narrower and more distanced from each other towards anterior chamber (Fig. 50). Penis shield absent.

Central nervous system (Figs. 51, 52): features similar to *Leiostracus carnavalescus* (see above), with the following differences: Central nervous system located more anteriorly, mostly on the ventral base of buccal mass (Fig. 39: nr). Ganglia more separated and more individualized. Pair of cerebral ganglia (ce) more separated from each other; cerebral commissure about as long as each ganglion; each ganglion with about half the size of adjacent esophageal section. Between cerebral ganglia and pedal ganglia, there are three parallel symmetrical connectives (cn), each circa three times as long as cerebral ganglia. Pair of pedal ganglia (pp) forming single mass, about as large as cerebral ganglia; weak constriction between the two pedal ganglia. Statocysts with several iridescent internal granules (Fig. 51: cy). Buccal ganglia well-developed, located laterally between esophageal origin and odontophore (Fig. 40: bg).

Measurements (in mm). Holotype: 4.75 whorls; H = 13.9; D = 11.7; S = 5.6; S' = 3.4; h = 8.7; d = 7.6. Mean (n = 9): ~4.5 whorls; H = 14.7 ± 0.8 (max 15.9; min 13.9); D = 11.5 ± 0.6 (max 12.3; min 10.4); S = 6.0 ± 0.3 (max 6.4; min 5.4); S' = 3.5 ± 0.3 (max 3.8; min 2.9); h = 9.2 ± 0.5 (max 10.1; min 8.4); d = 7.4 ± 0.5 (max 8.2; min 6.6).

Distribution

Known only from type locality.

Habitat

Found on low foliage.

Remarks

Rhinus botocudus n. sp. is reminiscent of only two Brazilian species: *R. velutinohispidus* (Moricand, 1836) and *R. longisetus* (Moricand, 1846), both from Bahia state (Simone 2006). *Rhinus botocudus* can be distinguished from *R. velutinohispidus* by being much smaller, barely reaching half the size of that species, and having a deeper suture and more convex whorls. *Rhinus botocudus* can be distinguished from *R. longisetus* by being larger, having a narrower spire and a more laterally positioned body whorl. Finally, *R. botocudus* has an arrangement of hairs on the periostracum similar to *R. ciliatus* (Gould, 1846), from Rio de Janeiro state (Simone 2006); nevertheless, it can be differentiated from this species by its smaller size, more rounded shell profile, lower spire, a whitish band on the middle portion of the body whorl and more separate spiral lines of hair.

Rhinus is an endemic South American genus, occurring in Venezuela and Brazil, being particularly diverse in the latter (Breure 1979, Simone 2006). Anatomically, the distinctive description above explored the main exclusivities of *R. botocudus* when compared with the known orthalicoids, and with *Leiostracus carnavalescus* described above. Particularly, the more remarkable exclusivities are: the origin of the tentacular muscle in the columellar muscle (Fig. 37); the absence of the esophageal duct to the anterior lobe of the digestive gland, which instead is located in the stomach (Fig. 39); the presence of three albumen chambers (Fig. 46); and the simple internal surface of the penis (Fig. 50). Additionally, of great interest are the multiple columellar muscles (Fig. 37: cm), similar to what is seen in *Leiostracus carnavalescus*. The analysis of these differences and shared features is still a matter of ongoing analysis.

Family Subulinidae
Genus *Obeliscus* Beck, 1837

Obeliscus boitata **n. sp.**
(Figs. 77–79)

Type material

Holotype: MZSP 106169 (Figs. 77–79).

Paratypes: MZSP 106170 (39 shells), from type locality. J. Coltro col., May/2012.

Type locality: Brazil. Minas Gerais: Nanuque, ~120 m of elevation (~17°51'S 40°23'W).

Etymology

The name (in apposition) is a reference to Boitatá, a fiery snake-like creature that protected the forests in Brazilian folklore.

Distribution

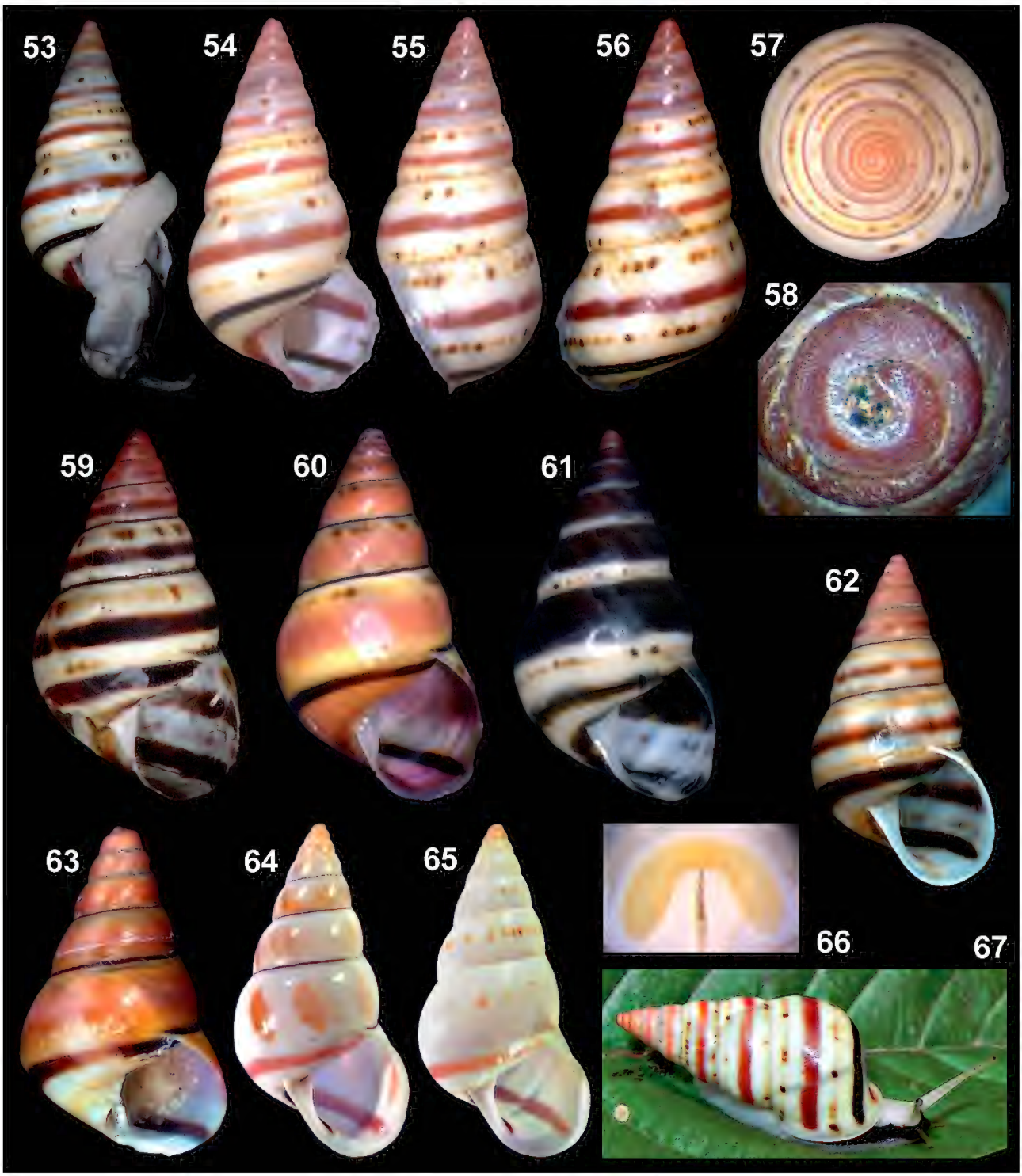
Known only from type locality.

Diagnosis

Spire top narrow, elongated. Spire apex (protoconch) bulbous, domed, thicker than subsequent spire portion. Suture perpendicular to shell length axis. Whorls with a faint keel on median region. Aperture rectangular.

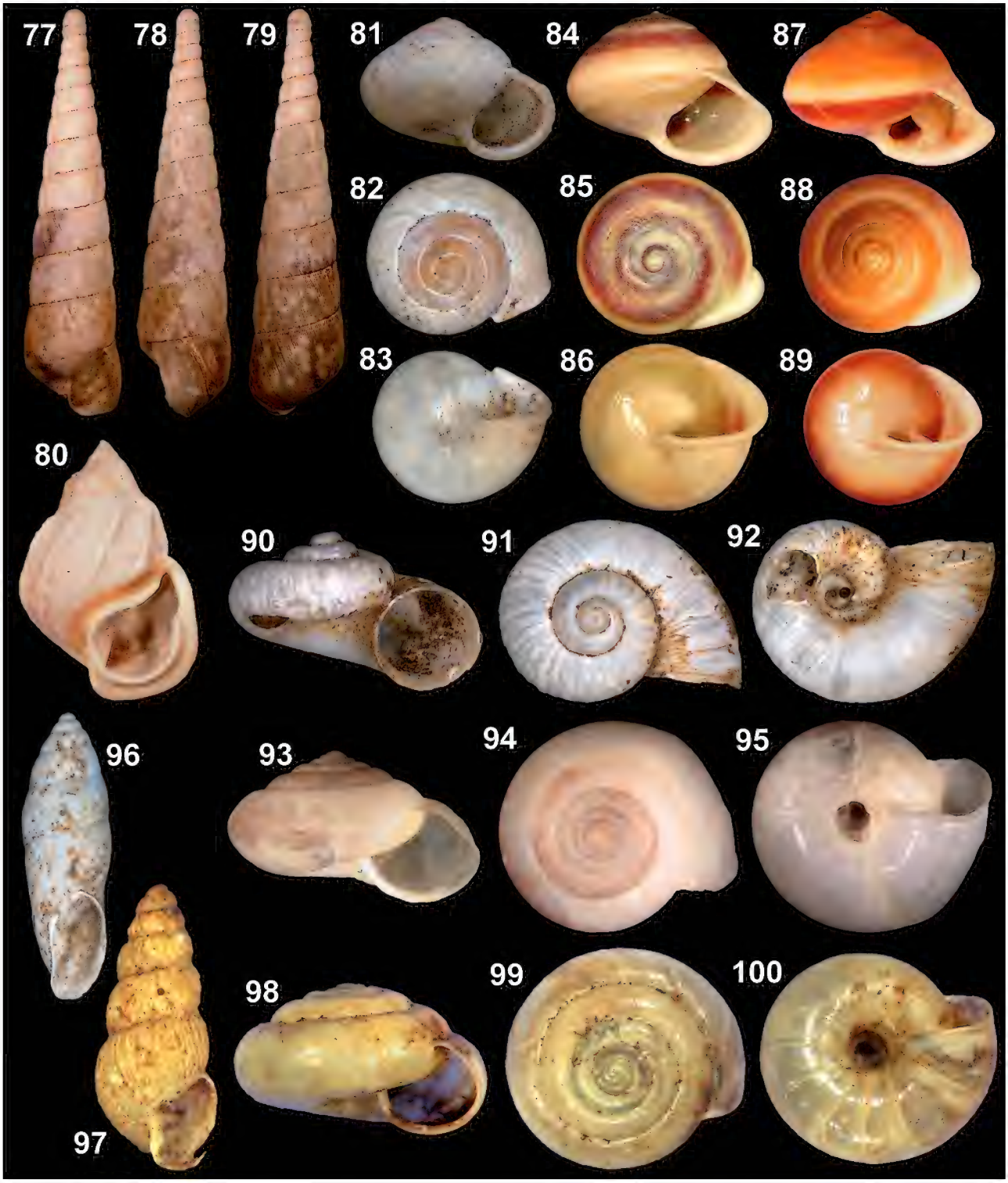
Description

Shell large, multispiral, thin, conical, imperforate; spire top narrow, elongated. Spire apex (protoconch) bulbous, domed, thicker than subsequent spire portion; diameter ~¼ shell length. Color translucent white to dirty white. Spire angle ~15°. Protoconch of ~2.75 whorls, rounded, dome-shaped, blunt, smooth; transition



Figs. 53–67. *Leiostracus carnavalescus* n. sp. – **53–57**. Holotype (MZSP 106177; H = 25.4 mm). **58**. Holotype, protoconch detail (inferior side = 2 mm). **59**. Paratype #1 (MZSP 106179). **60**. Paratype #2 (MZSP 106178; H = 21.2 mm). **61**. Paratype #3 (MZSP 106179). **62**. Specimen #1 from Pinheiros, Espírito Santo (MZSP 106618; H = 21.2 mm). **63**. Specimen #2 (juvenile) from Sooretama, Espírito Santo (MZSP 106666; H = 10.3 mm). **64**. Specimen #1 from Mantena, Minas Gerais (MZSP 108010). **65**. Specimen #2 from Mantena, Minas Gerais (MZSP 108010). **66**. Detail of mouth showing exposed portion of jaw (inferior side = 3 mm). **67**. Living specimen, paratype #4 (MZSP 106178).

Figs. 68–76. *Rhinus botocudus* n. sp. – **68–71**. Holotype (MZSP 106174; H = 13.9 mm, D = 11.7 mm). **72**. Same, detail of shell apex (inferior side = 2 mm). **73**. Same, detail of surface in middle-right side of last whorl, showing hairy periostracum (right side = 3 mm). **74**. Living specimen, paratype (MZSP 106175, H = 15.3 mm). **75**. Extracted jaw, in anterior to slightly posterior view (width = 1.2 mm). **76**. Jaw, as seen in situ, in anterior view.



Figs. 77–100. Land snails from Nanuque, Minas Gerais State, Brazil. – **77–79**. *Obeliscus boitata* n. sp., holotype (MZSP 106169; H = 50.3 mm). **80**. *Auris bilabiata* (MZSP 106155; H = 42 mm). **81–83**. *Helicina boettgeri* (MZSP 106166; D = 4.1 mm). **84–86**. *Helicina variabilis*, specimen #1 (MZSP 106171; D = 12.9 mm). **87–89**. *Helicina variabilis*, specimen #2 (MZSP 106172; D = 12.5 mm). **90–92**. *Cyclopomops moricandi* (MZSP 106168; D = 5.1 mm). **93–95**. *Rectartemon piquetensis* (MZSP 106156; D = 31.6 mm). **96**. *Bahiensis* cf. *bahiensis* (MZSP 106165; H = 16.2 mm). **97**. *Dysopeas muibum* (MZSP 106163; H = 5.7 mm). **98–100**. *Prohappia besckei* (MZSP 106164; D = 7.1 mm).

to teleoconch clear. Teleoconch sculptured by numerous thin axial striae, stronger on the upper portion of whorl near the suture. Whorl profile slightly convex; faint keel on median region. Suture well-marked. Aperture small, prosocline, oval to rectangular; ~ 1/5 shell length, ~ ½ shell width. Peristome simple, weakly reflexed. Body whorl ~ ¼ shell length.

Measurements (in mm). Holotype: 13.75 whorls; H = 50.3; D = 11.9; S = 40.9; S' = 35.9; h = 9.7; d = 6.1. Mean (n = 10): from 13.5 to 14.5 whorls; H = 49.1 ± 1.9 (max 52.0; min 47.0); D = 11.5 ± 0.4 (max 11.9; min 10.8); S = 40.1 ± 1.8 (max 43.2; min 38.0); S' = 35.6 ± 1.3 (max 37.9; min 33.7); h = 9.4 ± 0.4 (max 10.0; min 8.6); d = 6.0 ± 0.3 (max 6.4; min 5.6).

Remarks

Obeliscus boitata n. sp. closely resembles, in overall shell shape and color, only *O. carphodes* (Pfeiffer, 1852) and *O. sylvaticus* (Wagner, 1827); the known distribution of the latter is given as a vague "northeastern Brazil", while the former's is even vaguer, given simply as "Brazil" (Simone 2006). *Obeliscus boitata* n. sp. can be distinguished from both these species by its narrow and elongated spire, bulbous protoconch, faint keel and a suture more perpendicular to the shell length's axis. It can be further differentiated from *O. carphodes* by its smaller size and rectangular aperture and from *O. sylvaticus* by its larger size and shorter whorls.

4 Discussion

Besides the new species described above, a list of the other species found in the land snail sample from Nanuque can be seen on Tab. 1. The records of some species presented here are the first ones for Minas Gerais state: *Auris bilabiata* (Broderip & Sowerby, 1829) (Fig. 80), *Helicina boettgeri* Wagner, 1910 (Figs. 81–83), *Helicina variabilis* Wagner, 1827 (Figs. 84–89), *Cyclopomops moricandi* (Pfeiffer, 1852) (Figs. 90–92), *Rectartemon piquetensis* (Pilsbry, 1930) (Figs. 93–95), *Bahiensis* cf. *bahiensis* (Moricand, 1833) (Fig. 96), *Dysopeas muibum* Marcus & Marcus, 1968 (Fig. 97) and *Prohappia besckei* (Dunker in Pfeiffer, 1847) (Figs. 98–100). Although Nanuque is located very close to the borders with Bahia and Espírito Sato states (Fig. 1), the present records still represent an extension in the distribution of these species (Tab. 1). Most of the species presented here belong to genera already well recorded for the Brazilian southeast region, but three genera in particular (*Cyclopomops* Bartsch & Morrison, 1942, *Dysopeas* Baker, 1927 and *Prohappia* Thiele, 1927) are completely new records for Minas Gerais.

The natural environment around Nanuque was severely degraded by incessant woodcutting, crops, breeding of livestock and the construction of railroads and highways since the final decades of the 19th century (Cerqueira Neto 2005, Martins 2010). Nevertheless, the single forest fragment studied here still harbors a unique fauna and even new species. Our findings in Nanuque are a reminder of how these remnants of Atlantic rainforest might be acting as refuges (e. g., Pereira et al. 2014), harboring still unknown diversity and perhaps even their own share of endemic species. Despite the regions' flora and fauna being scarcely studied, a high level of biodiversity is thought to be the norm for the broader region encompassing Nanuque and its surroundings and concerns about extinction have already been raised for plant and fish species (Cerqueira Neto 2005, Sarmento-Soares et al. 2007).

Alarmingly, José Coltro Jr. and his team returned much more recently to the same forest fragment in Nanuque, only to discover that it was nearly entirely devastated in order to open space for more tomato crops. Whether the new species described here have already become extinct remains to be seen, as they may still live unknown and undisturbed in other localities (*Leiostracus carnavalescus*, for instance, also occurs elsewhere). Still, it is well-known that many species are becoming extinct before been even known to science (e. g., Hawksworth & Cowie 2013), even in groups prone to greater study and protection efforts, like birds (e. g., Pereira et al. 2014). Therefore, the situation might be much direr for land and freshwater mollusks, which are deemed the most imperiled group of animals, with the highest extinction rates (Lydeard et al. 2004, Régnier et al. 2008). Despite basic science being currently out of vogue, a more thorough knowledge of the local fauna and flora of these critical places is the first step towards protection and appropriate legislation.

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Two new species and new records of terrestrial isopods (Isopoda: Oniscidea) from Oman

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Abstract

A small but highly interesting collection of terrestrial isopods from Oman is reported. The new species *Xeroniscus siegfriedhuberi* **n. sp.** and *Somalodilloides pseudopilosus* **n. sp.** are described and illustrated, and new records are given for the species *Chaetophiloscia* sp., *Periscyphis omanensis*, *Xeroniscus erythraeus* and *X. troglophilus*.

Key words: Isopoda, Oniscidea, Oman, new species, new records.

Zusammenfassung

In einer kleinen, aber hochinteressanten Aufsammlung von Landisopoden aus dem Oman fanden sich die neuen Arten *Xeroniscus siegfriedhuberi* **n. sp.** und *Somalodilloides pseudopilosus* **n. sp.**, die beschrieben und abgebildet werden, und neue Nachweise von *Chaetophiloscia* sp., *Periscyphis omanensis*, *Xeroniscus erythraeus* and *X. troglophilus*.

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1 Introduction

Until the year 1988 only one species of the Oniscidea was known from Oman (*Tylos maindroni* Giordani Soika, 1954). Ferrara & Taiti (1988) reported six additional species from the country. In the most recent publication on Oman's terrestrial isopods (Taiti et al. 2000) a number of additional species are recorded, adding up to 17 species known from the country.

In the year 2000 Siegfried Huber accompanied Prof. Peter Weygoldt on a collecting tour through Oman and collected a number of isopod samples. This new material contains two species new to science and new records of four additional species, two of which are reported for the first time from Oman, thus extending their distribution area considerably.

The new records increase the number of terrestrial isopod species known from this country to the following 21 species:

Ligia pigmentata Jackson, 1922
Tylos maindroni Giordano Soika, 1954
Chaetophiloscia sp.
Agnara gallagheri (Ferrara & Taiti, 1988)
Agnara madagascariensis (Budde-Lund, 1885)
Porcellionides pruinosus (Brandt, 1833)
Agabiformius lentus (Budde-Lund, 1885)
Proporcellio vulcanius Verhoeff, 1908 (= *P. quadriseriatus*)
Porcellio evansi Omer-Cooper, 1923
Porcellio sp.
Periscyphis vittatus (Omer-Cooper, 1926)
Periscyphis albomarginatus Taiti, Ferrara & Allspach, 1997
Periscyphis insularis Ferrara & Taiti, 1988
Periscyphis omanensis Taiti & Ferrara, 1991
Periscyphis dhofarensis Taiti, Ferrara & Davolos, 2000
Xeroniscus troglophilus Taiti, Ferrara & Davolos, 2000
Xeroniscus erythraeus (Ferrara, 1972)
Xeroniscus siegfriedhuberi n. sp.
Omanodillo gardneri Taiti, Ferrara & Davolos, 2000
Somalodillo paeninsulae Ferrara & Taiti, 1986
Somalodilloides pseudopilosus n. sp.

Acknowledgments

Siegfried Huber (Uhldingen-Mühlhausen/Germany) has donated the isopod material used in this article to the SMNS; Dr. S. Taiti (Florence/Italy) gave advice for the identification of the treated species, he and Dr. S. Sfenthourakis (Nicosia/Cyprus) helped to improve the original manuscript, and Dr. K. Wolf-Schwenninger (SMNS) operated the scanning electron microscope and the Leica Macroscope. To all of them I wish to express my sincere thanks. Collection permission was granted to Prof. P. Weygoldt (no. 07/2000, date 23.IX.2000).

2 Methods

Photographs were taken through a Leica Z16 APO Macroscope, processed with Leica Application Suite Version 3.1.8 to obtain combined photographs with extended depth of field; Fig. 1 is a SEM-photograph from air-dried material. The mounted specimen was coated with a 20 nm Au/Pd layer and examined with a Zeiss EVO LS15 scanning electron microscope.

Abbreviation

SMNS Staatliches Museum für Naturkunde Stuttgart (+ number of isopod collection), Germany

3 New terrestrial isopod material from Oman

3.1 *Chaetophiloscia* sp.

Bibliography

Schmalfuss 1990: 170, figs. 1–17; Schmalfuss 1991: 2, figs. 4–5.

New material

1 ♂, 2 ♀♀, northern Oman, near Al Hamra, W of Nizwa, leg. S. Huber, IX.2000 (SMNS 11485).

Remarks

Up to now the species of this genus were known from the Mediterranean region. The new record extends the distribution area considerably to the southeast. However, it cannot be excluded that the new record from Oman is due to anthropogenous introduction. The specimens show similarities to *C. cellaria*, but this taxon seems to consist of a number of separate species. The male is somewhat damaged, so no exact illustrations of the diagnostic characters (pleopods) can be given.

3.2 *Periscyphis omanensis* Taiti & Ferrara, 1991

Bibliography

Taiti & Ferrara 1991: 219, figs. 5a–5i; Taiti et al. 2000: 147, 152.

New material

1 ♀, SW-Oman, Dhofar, Tawi Atayr, Wadi Dharbat, ± 30 km SE of Salalah, leg. S. Huber, X.2000 (SMNS 11483). – 5 ♂♂, 4 ♀♀, SW-Oman, Dhofar, no exact locality, leg. S. Huber, X.2000 (SMNS 11484). – 1 ♀, northern Oman, near Al Hamra, W of Nizwa, leg. S. Huber, IX.2000 (SMNS 11485). – 3 ♂♂, northern Oman, Al Hamra, W of Nizwa, 23°04′45″N, 57°21′10″E, leg. S. Huber, IX.2000 (SMNS 11485).

Distribution

The species is known only from Oman, where it has been found in the northern and in the southwestern parts.

3.3 *Xeroniscus erythraeus* (Ferrara, 1972) (Fig. 1)

Bibliography

Ferrara 1972: 211, figs. 2–13 (*Periscyphis e.*); Ferrara & Taiti 1986: 96, figs. 7a–f, 17 (*Periscyphis e.*); Ferrara & Taiti 1990: 93, figs. 1, 4A–4C.

New material

2 ♂♂, 1 ♀, Northern Oman, near Al Hamra, W of Nizwa, leg. S. Huber, IX.2000 (SMNS 11485).

Distribution

The species *X. erythraeus* was known up to now from northern Ethiopia and from southwestern Saudi Arabia. First record for Oman.

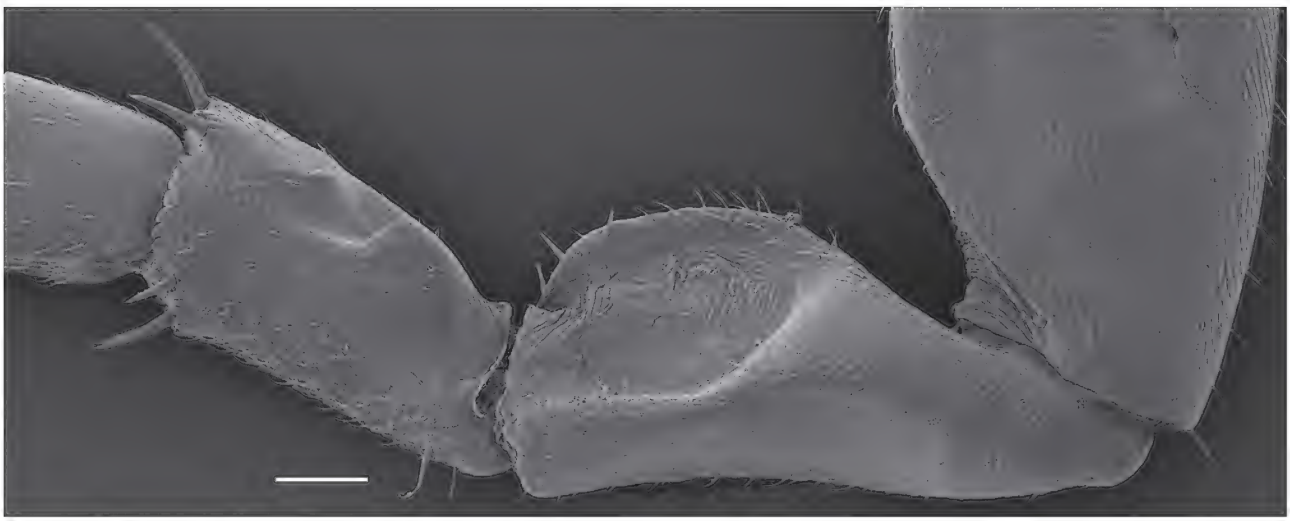


Fig. 1. *Xeroniscus erythraeus*, ♂, 7 × 3 mm (SMNS 11485), pereopod 7, frontal view, SEM-photograph. – Scale: 0.1 mm.

3.4 *Xeroniscus siegfriedhuberi* **n. sp.** (Figs. 2–12)

Material examined

Holotype: ♂, ~16 × 8 mm, SW-Oman, Dhofar, Tawi Atayr, Wadi Hinna, ±40 km NE of Salalah, leg. S. Huber, X.2000 (SMNS T602).

Paratypes: 3♂♂, 5♀♀, same data as holotype (SMNS 11482).

Derivatio nominis

The species is dedicated to Siegfried Huber (Uhldingen-Mühlhausen/Germany) who collected a great number of highly interesting isopod samples in many parts of the world and donated them to the SMNS.

Description

Maximum dimensions: 16 × 8 mm.

Coloration: Tergal parts yellowish, head with dark grey central part, pereon-tergite 1 with dark anterior and posterior stripe and a medial dark bridge, the remaining pereon-tergites with dark posterior stripes and two rows of dark medial speckles, pleon completely dark except epimera, so the animal gives a zebra-like impression.

Cuticular structures: Tergites smooth.

Eyes with around 22 ommatidia arranged in 4 rows (ammonite type). Cephalon with profrons slightly convex, pronounced lateral lobes triangular, interocular line visible except in the middle (Fig. 8). Pereonite 1 with strongly concave posterior margin, frontal corners bent upwards (Figs. 8–9). Posterior margin of pereonite 7 sinuous. Telson slightly wider than long, but laterally deeply excavated, thus with a long narrow distal part, apex pointed (Fig. 10). Antennae with first flagellar article twice as long as second.

Male: Pereopods 1–3 with brushes of terminally forked spines on merus and carpus (Fig. 11). Pereopod 7 long and slender, merus proximally with process, ischium ventrally concave, frontally with ridge delimiting a conspicuous depression (Fig. 12). Pleopods 1–5 see Figs. 2–7.

Distribution

Southwestern Oman, only known from the type locality in Dhofar.

Differential diagnosis

The ascription of this new species to the genus *Xeroniscus* is based on the morphology of the pleopod-exopodites. They have the same structure as in other species of *Xeroniscus*, with respiratory organs in all five exopodites (see Figs. 2–7). The body structure is somehow different from other species of the genus, with pronounced but interrupted interocular line and deeply rounded concavities in the hind margin of the first pereon-tergite (see Figs. 8, 9; compare Ferrara & Taiti 1990 for figures of these characters in other species of *Xeroniscus*).

3.5 *Xeroniscus troglophilus* (Taiti, Ferrara & Davolos, 2000)

Bibliography

Taiti et al. 2000: 154, figs. 4a–k, 8.

New material

1 ♀, northern Oman, Al Hamra, Al Hota Cave, 23°06′14″N, 57°21′58″E, leg. S. Huber, IX.2000 (SMNS 11486).

Distribution

The species is known only from the type locality in Oman (Al Hota/Al Fallah Cave system, detailed description in Hanna & Al-Belushi 1996).

3.6 *Somalodilloides pseudopilosus* **n. sp.** (Figs. 13–19)

Material examined

Holotype: ♂, ~5.0 × 2.3 mm, northern Oman, Al Hamra, W of Nizwa, leg. S. Huber, IX.2000 (SMNS T603).

Derivatio nominis

The species name indicates the great similarity with *S. pilosus* Taiti & Ferrara, 2004 (see Taiti & Ferrara 2004: 298, figs. 58a–h, 59a–h, pl. 25).

Description

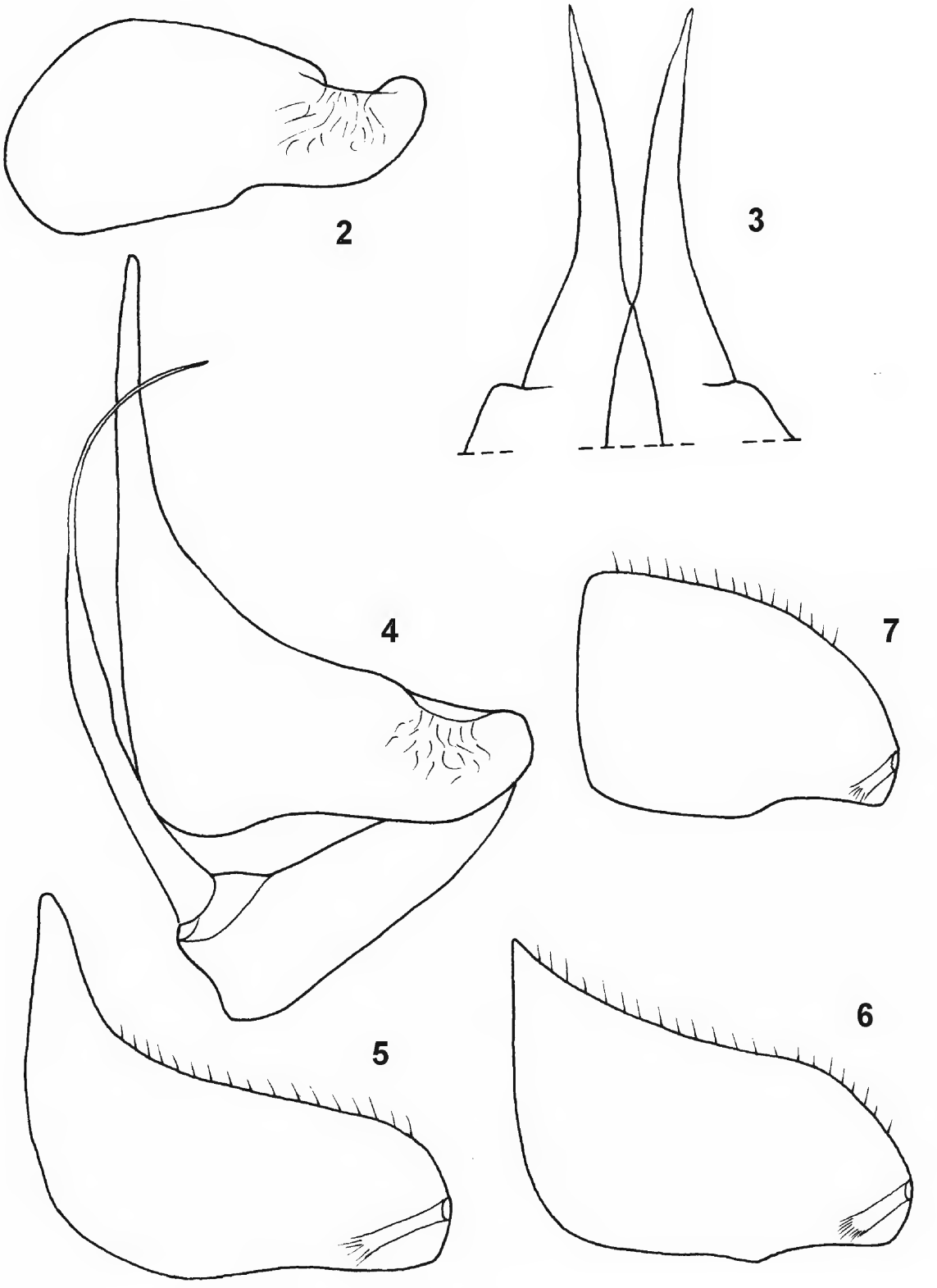
Dimensions: ~5.0 × 2.3 mm.

Coloration: White without pigmentation.

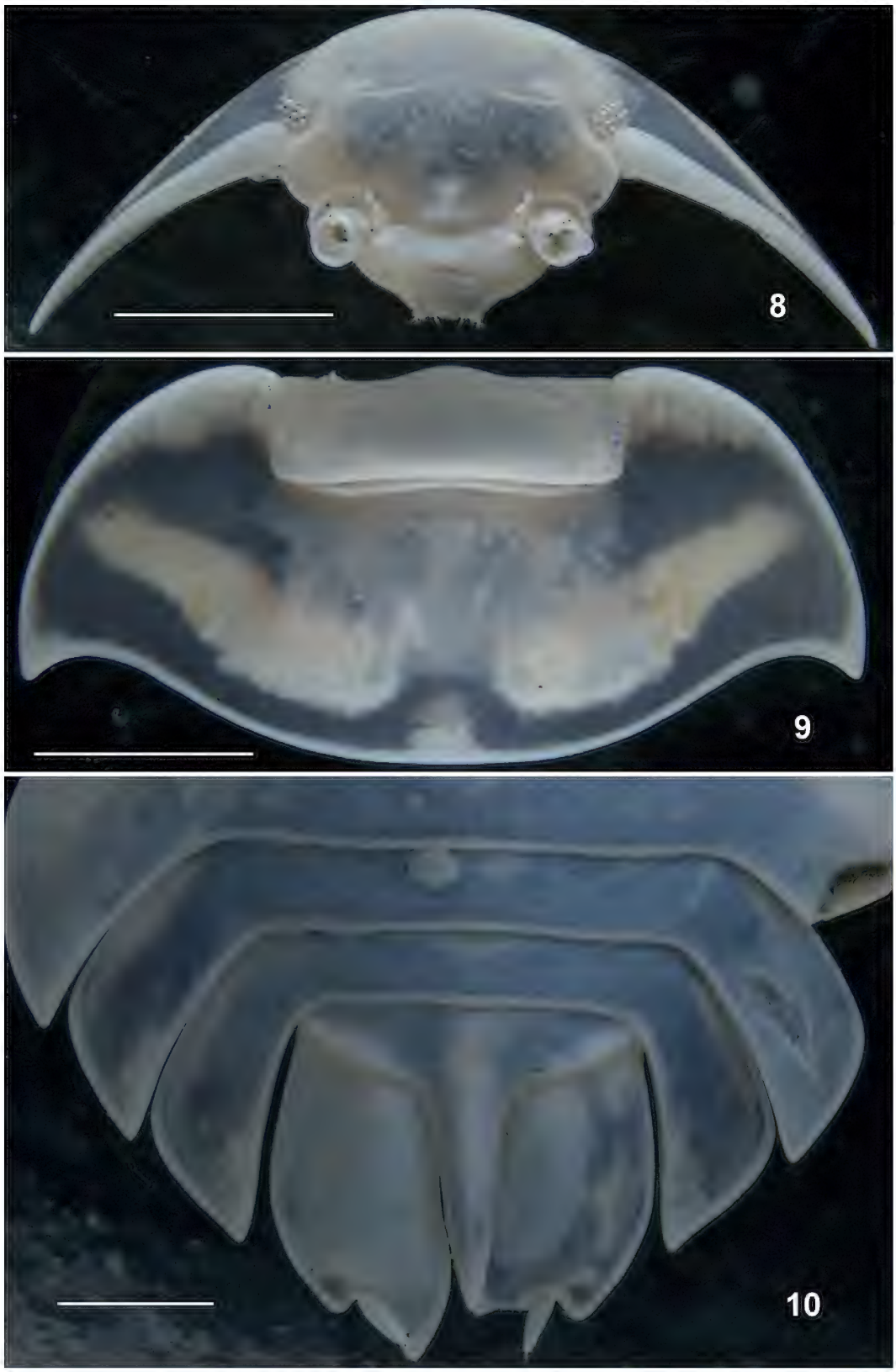
Cuticular structures: Tergites thickly covered with apically blunt scale-setae (Fig. 13), which are on posterior margins of tergites not fan-shaped as in *S. pilosus*; body outline fringed with long pointed setae as in *S. pilosus*.

Eyes with around 10 ommatidia. Cephalon with thin margin separating frontal shield and vertex. Pereon-epimeron 1 with lateral thickening, dorsally not concave, separated from sulcus arcuatus by a ridge, sulcus arcuatus extending along epimeron about three quarters of its length, anteriorly not as wide as in *S. pilosus* (Figs. 13, 15). Posterior margin of pereon-tergite 1 straight. Outer and inner lobe of schisma rounded, the inner one slightly protruding backwards as in *S. pilosus*. Telson with short distal part and truncate apex as in *S. pilosus* (Fig. 16). Antenna short and stout, flagellum as long as distal article of peduncle, distal flagellar article three times as long as proximal one. Pereopods with long pointed setae without denticulate apex (Fig. 14). Uropod with minute exopodite, inserted dorsally near posterior margin of protopodite.

Male: Pereopods without sexual modifications. Pleopod-exopodite 1 about twice as wide as long with rounded medial part, endopodite 1 with distal part straight (Fig. 17). Pleopod-exopodite 2 with very long medial part, which is only slightly surpassed by endopodite 2 (Fig. 18).



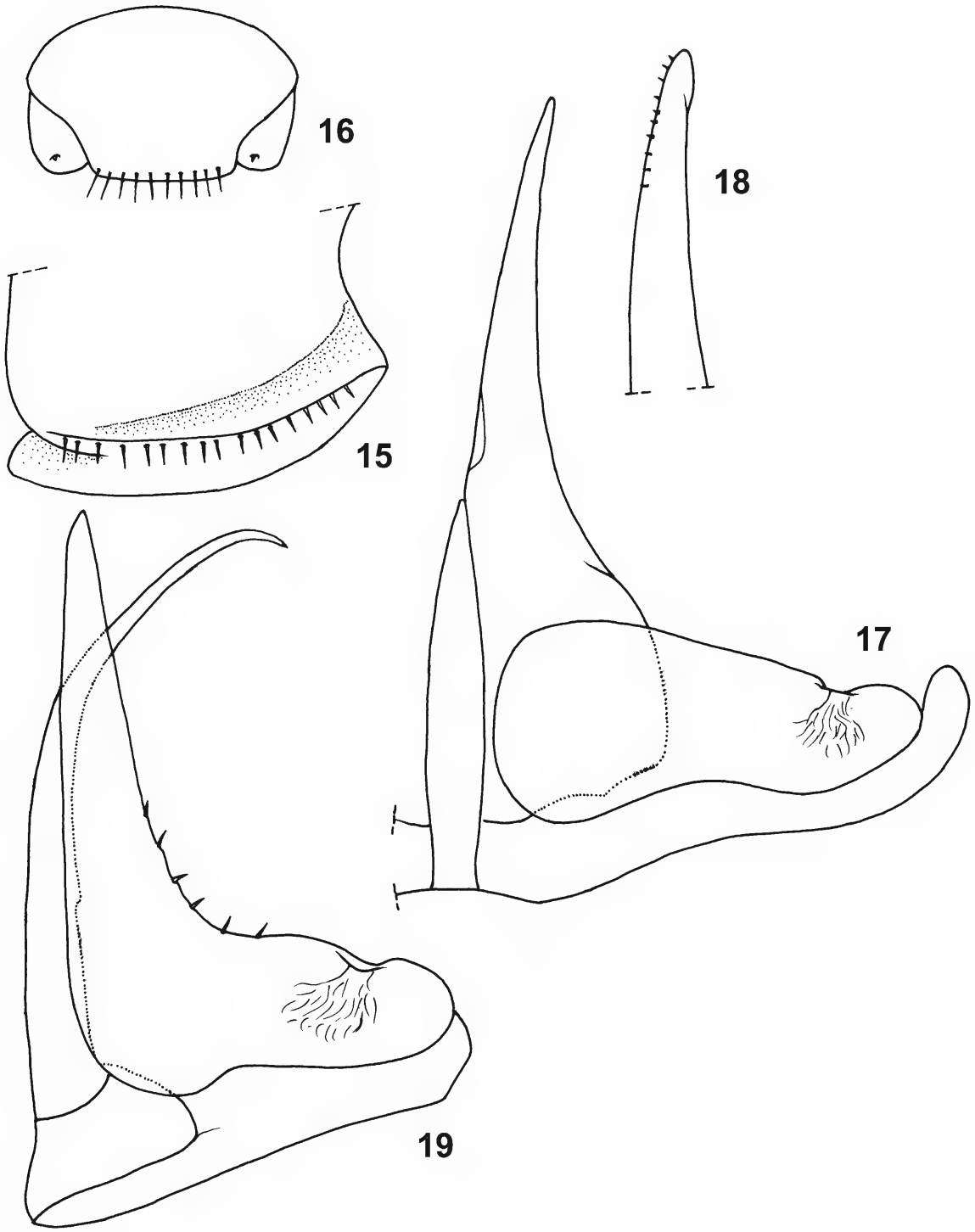
Figs. 2–7. *Xeroniscus siegfriedhuberi* n. sp., holotype ♂, 16 × 8 mm (SMNS T602). – **2**. Pleopod-exopodite 1. **3**. Pleopod-endopodites 1, apical parts. **4**. Pleopod 2. **5**. Pleopod-exopodite 3. **6**. Pleopod-exopodite 4. **7**. Pleopod-exopodite 5.



Figs. 8–10. *Xeroniscus siegfriedhuberi* n. sp., holotype ♂, 16 × 8 mm (SMNS T602). – **8**. Head and pereon-segment 1 in frontal view. **9**. Head and pereon-segment 1 in dorsal view. **10**. Terminal part of pleon, dorsal view. – Scales: 2 mm (8–9), 1 mm (10).

Figs. 11–12. *Xeroniscus siegfriedhuberi* n. sp., holotype ♂, 16 × 8 mm (SMNS T602). – **11**. Pereopod 1, frontal view **12**. Pereopod 7, frontal view. – Scales: 1 mm.

Figs. 13–14. *Somalodilloides pseudopilosus* n. sp., holotype ♂, ~5.0 × 2.3 mm (SMNS T603). – **13**. Lateral view of whole animal. **14**. Pereopod 7. – Scales: 1 mm (13), 0.2 mm (14).



Figs. 15–19. *Somalodilloides pseudopilosus* n. sp., holotype ♂, ~5.0 × 2.3 mm (SMNS T603). – **15**. Lateral view of pereon-segment 1. **16**. Dorso-caudal view of telson and uropods in situ. **17**. Pleopod 1 in ventral view. **18**. Apex of pleopod-endopodite 1 enlarged. **19**. Pleopod 2 in ventral view.

Distribution

The new species is known only from the type locality in northern Oman.

Differential diagnosis

Somalodilloides pseudopilosus n. sp. is very similar to *S. pilosus* from Socotra Island (see TAITI & FERRARA 2004: 298, figs. 58a–h, 69). There are, however, some differences which seem to justify the erection of a new species: Sulcus arcuatus shorter, extending for only two thirds of the length of the epimeron, anteriorly not unusually widened; setae on pereopods with pointed apex, not denticulate as in *S. pilosus*; male pleopod-exopodite 1 with rounded medial corner, not angulate as in *S. pilosus*; width-length relation of pleopod-exopodite 2 is 1.0 : 1.6 (in *S. pilosus* 1.0 : 1.1).

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Two new genera of Caeninae (Ephemeroptera: Caenidae), with a cladistic analysis of the tribe Clypeocaenini

Peter Malzacher & Arnold H. Staniczek

Abstract

The new genera *Mandelara* **n. gen.** (type species *M. immutata* **n. sp.**) from South Africa and *Papuaenis* **n. gen.** (type species *P. balkei* **n. sp.**) from Papua New Guinea are described. Both genera are included in the tribe Clypeocaenini that is defined by a bulged frons and more or less protruding clypeus. A cladistic analysis recovers the Clypeocaeninae as monophyletic. Caenini + Tasmanocoenini are revealed as sister group to Clypeocanini, together constituting the subfamily Caeninae. A larval key in provided to the genera of Clypeocaenini.

Keywords: Clypeocaenini, new genera, *Mandelara*, *Papuaenis*, phylogeny, South Africa, Papua New Guinea.

Zusammenfassung

Zwei neue Gattungen der Familie Caenidae werden beschrieben: *Mandelara* **n. gen.** (Typus-Art *M. immutata* **n. sp.**) von Südafrika und *Papuaenis* **n. gen.** (Typus-Art *P. balkei* **n. sp.**) von Papua Neuguinea. Beide Gattungen werden dem Tribus Clypeocaenini zugeordnet, dessen Gattungen sich durch ausgebeulte Frons und mehr oder weniger vortretenden Clypeus auszeichnen. Durch eine kladistische Analyse wird die Monophylie des Tribus abgesichert. Caenini + Tasmanocoenini bilden die Schwestergruppe der Clypeocaenini, alle zusammen die Unterfamilie Caeninae. Es wird ein Larvenschlüssel für die Gattungen der Clypeocaenini erstellt.

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1 Introduction

Malzacher (2013) established the tribe Clypeocaenini within the subfamily Caeninae. The Clypeocaenini so far comprise the genera *Kalimaenis* (Oriental region, two species), *Amercaenis* (Nearctic region, two species), *Callistellina* (Madagascan region, one species), *Trichocaenis* (Madagascan region, one species), *Provonshara* (Ethiopian region, one species), *Clypeocaenis* (Ethiopian and Oriental regions, seven species), and *Barnardara* (Ethiopian region, one species) (Malzacher 2013, 2014). All these genera share two synapomorphic characters that define the Clypeocaenini as monophyletic taxon, namely (1) the reduction of filaments on abdominal gill III to 8 filaments at most, and (2) head bulged in lateral view, clypeus more or less protruding (Malzacher 2013).

In this contribution, two new monospecific genera, *Mandelara* n. gen. from South Africa and *Papuaenis* n. gen. from Papua-New Guinea, are described and placed within Clypeocaenini.

Malzacher (2013) presented a first phylogeny of Clypeocaenini and improved it with the description of *Provonshara* (Malzacher 2014). Both phylogenies were based on traditional Hennigian methodology. In this contribution, for the first time a cladistic analysis of Clypeocaenini is performed to check the monophyly of this taxon and to unravel its intergeneric relationships.

Acknowledgements

We are indebted to Michel Sartori and Jean-Luc Gattolliat (Musée cantonal de Zoologie, Lausanne) for providing material to this study, to Susanne Leidenroth and Milan Pallmann (Staatliches Museum für Naturkunde, Stuttgart) for making SEMs and microphotographs, and to Michel Sartori who kindly read the manuscript and provided valuable suggestions.

2 Material and methods

The investigated material is preserved in 75% ethanol. *Mandelara* specimens were collected by a joint collection of the Musée Cantonal de Zoologie, Lausanne and Albany Museum,

Grahamstown in the Kruger National Park, South Africa, and that of *Papuaenis* by the BALKE Expedition 2006 (Zoologische Staatssammlung München) in Papua New Guinea. The holotypes and paratypes are stored in the Musée cantonal de Zoologie, Lausanne.

Specimens used for SEM were dehydrated through a stepwise immersion in ethanol and then dried by critical point drying. The mounted material was coated with a 20 nm Au layer, examined and photographed with a Zeiss EVO LS 15 scanning electron microscope. Macrophotographs were taken with a Leica Z16APO Macroscope, processed with Leica Application Suite™ Version 3.1.0 to obtain combined photographs with extended depth of field. All digital photographs were subsequently enhanced by using PhotoFiltre 7.2.1.

For the cladistic analysis, 14 species of Caenidae were selected, *Neoephemera youngi* (Neoephemeridae) was chosen as outgroup (details see under section 5). Seven imaginal and 17 larval characters (see section 5) were chosen and treated as unordered character (except of character 15, which was treated as ordered). The data matrix (Tab. 1) was compiled in Nexus Data Editor (NDE) v.0.5.0 in ss file format converted into NEXUS file format (MADDISON et al. 1997), and analysed using TNT v.1.1 (Tree analysis using Traditional Search) (GOLOBOFF et al. 2008). For the Traditional Search, 99999 randomly seeded Wagner trees with 10000 replications were computed with 100 trees to save per replication. All trees found were kept. A strict consensus tree was calculated using all trees. The matrix was resampled with Jacknife 36 % removal probability, number of replicates 10000, output results as frequency differences (GC). Consensus tree and Jacknife yielded identical trees. Synapomorphies common to all calculated trees were delineated.

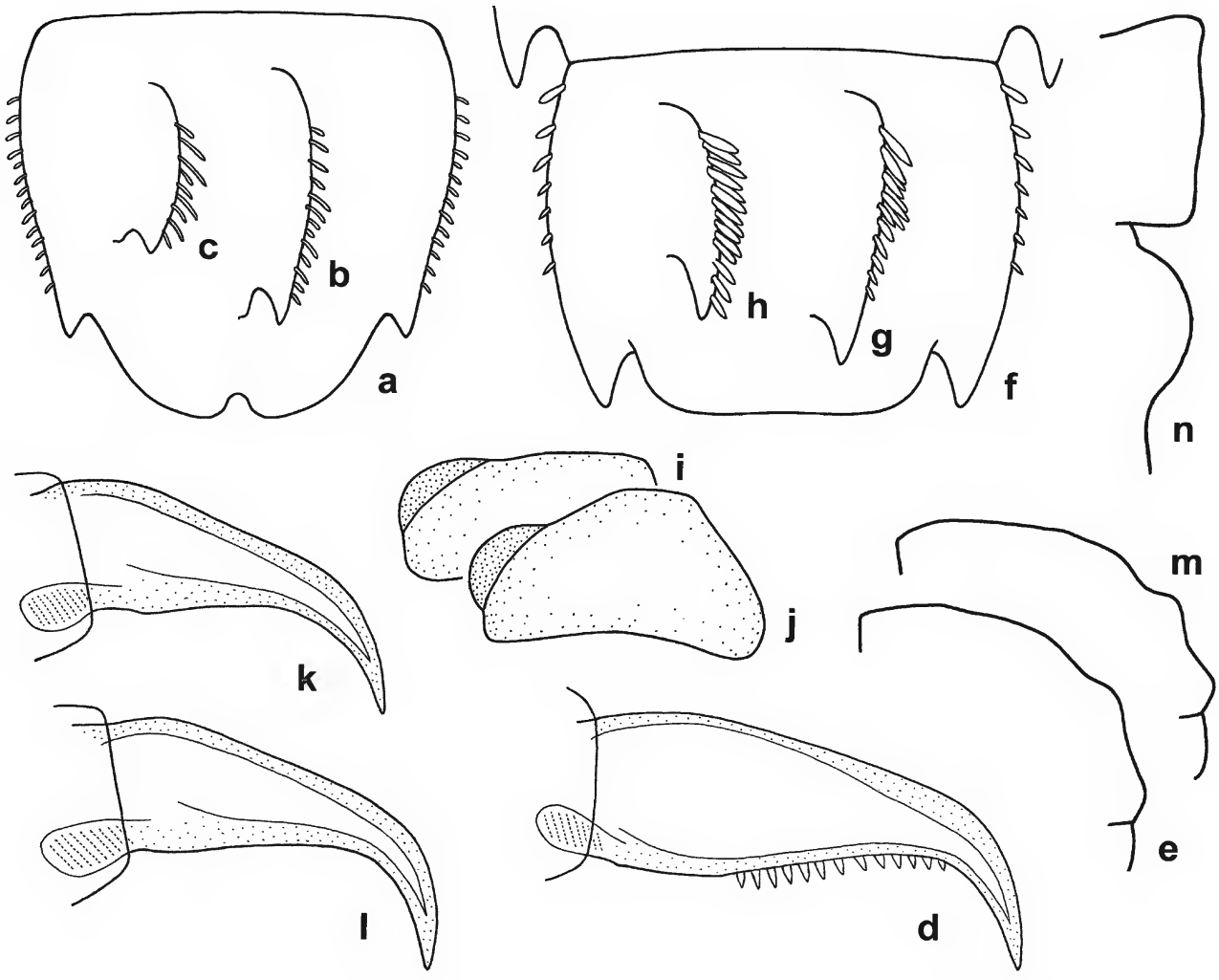


Fig. 1. *Mandelara immutata* n. sp., larva (a–e), *Papuaenis balkei* n. sp., larva (f–n). – **a**, **f**. Sternum IX. **b**, **g**. Marginal setation of segment VII. **c**, **h**. Marginal setation of segment V. **d**, **l**. Hind claw. **e**, **m**. Outline of head, lateral view. **i**. Coxal process of mid leg. **j**. Coxal process of hind leg. **k**. Fore claw. **n**. Lateral outline of pronotum and anterior part of mesonotum.

3 Systematic account

3.1 Genus *Mandelara* **n. gen.**

Type species: *Mandelara immutata* n. sp. by present designation.

Etymology

The genus is dedicated to NELSON MANDELA (1918–2013), the late president of the Republic of South Africa.

Differential Diagnosis

Mandelara n. gen. can be characterised and distinguished from all other genera of Caenidae by the following combination of characters:

L a r v a . Great parts of cuticle covered with shield- or funnel-shaped microtrichia (Figs. 6, 7). – Thorax broadened (Fig. 2). – Head without ocellar tubercles. – Outline of head with bulges in lateral view (Fig. 1e). – Clypeus scarcely protruding anteriorly, without setation (Fig. 3). – Maxillar and labial palps three-segmented. – Fore tibia and fore tarsus without filtering setae. – Mid and hind tibia ventrally without long bristles. – Operculate gill ventrally with an irregular row of simple, scale-shaped microtrichia, basal half of row also with clusters of spines and numerous single spines (Fig. 5). – Row not reaching hind margin of gill (Fig. 4). – Nearly all filaments of gill III 1- or 2-branched, only 1(–3) filaments with 3 or more branches. – Lateral spines of abdomen not bent dorsally. – Posterior part of sternum IX rounded, not shortened, hind margin medially with a small semicircular indentation (Fig. 1a). – Abdominal terga VII–IX without mediolongitudinal ridge. – Hind margin of sternum IX without a bipointed process with concave margin between the points.

On the differences to other genera of the Clypeocaenini see the larval key below (section 4).

Mandelara immutata **n. sp.**
(Figs. 1a–e, 2–8)

H o l o t y p e , ♀ larva (microslide): South Africa, Riv. Crocodile/Riv. Incomati, KNP near Malelane, 31°37′04″ E, 25°23′57″ S, 17.V.2003.

P a r a t y p e : 1 larva, same dates as holotype.

Etymology

The species epithet is chosen because of the lack of unambiguous autapomorphies.

L a r v a

Measurements and colouration

Subadult female larva, body length 3.3 mm, length of cerci 2.5 mm.

Colouration of cuticle: Intense yellowish-brown, legs and abdomen lighter.

Epidermal pigmentation: Head in front of lateral ocelli dark brownish-grey, with a blackish line between the bases of antenna. Abdominal terga I, II and VII–IX with broad transverse brownish bands; operculate gills brownish, most intense in anterolateral part.

Morphology

Cuticle: Large parts of dorsal and ventral side covered with laminar, shield- or funnel-shaped microtrichia (Figs. 6, 7) (often hardly to be seen in light microscope). Cuticle of abdomen and operculate gill denticulated. Denticles of different length and shape and mostly covered by the laminar microtrichia (Fig. 6).

Head: Outline of head bulged in lateral view (Fig. 1e). Clypeus scarcely protruding anteriorly; genae moderately bulging out (Fig. 3). Mandibles dorso-laterally with bristles of different length. Maxillary palp relatively short and broad; segment 3 of labial palp as long as segment 2 (Fig. 3b).

Thorax: Sides of pronotum straight and parallel (Fig. 3a). Legs relatively short and stocky. Transverse row on fore femur consisting of 8–12 spatulate bristles of moderate length. Coxal processes forming inconspicuous ridges. Mid and hind legs with simple bristles of different length more or less blunt, on femora and tibiae nearly all bristles marginally. Fore tarsus with an inner row of about 10–12 strong simple bristles. Mid tarsus with inner row of 10–12 simple bristles and short outer row of 0–4 simple bristles, the apical one unipinnate. Hind tarsus with inner row of 10–12 simple bristles, the apical ones long and slender, and an outer row of about 10 small and simple bristles, the apical 4 unipinnate. Claws of all legs slightly bowed, with about 12 denticles (Fig. 1d).

Abdomen: Posterolateral processes short (Fig. 2). Lateral margins with short spatulate or blunt bristles (Fig. 1a–c). Posteromedian process of tergum II long, triangular and pointed, slightly bowed in lateral view. Hind margin of tergum VII with spatulate bristles (Fig. 8a), VIII–X with strong denticles apically more or less rounded (Fig. 8b, c), tergum VIII with a few additional bristles, clearly shorter than those from tergum VII (Fig. 8b). Basal half of tergum VII densely covered with long bipinnate bristles (Fig. 7). Hind margin of sternum IX with a semicircular indentation, dorsal shagreen not discernible (Fig. 1a). Gill I nearly half as long as operculate gill. Lateral and hind margins of operculate gill with short spatulate and pinnate bristles (Figs. 4, 6), inner margin with thin and pointed ones. Medial ridge slightly keeled, with 3–4 short and strong bristles at the base. On ventral side of operculate gill an irregular row of microtrichia running in a greater distance from lateral and hind margin, ending far from the latter (Fig. 4). The row consists of simple scales of different size and shape, in the basal part of the row also with clusters and a broad band of single spines (Fig. 5a, b). Gills III(–V) with only 1 filament with 3 branches; all the

Fig. 2. *Mandelara immutata* n. sp., larva, light microscope (a), young larva, SEM (b).

other filaments (about 30) simple or two-branched. Basal segments of cerci with apically rounded bristles.

Imaginal stages unknown.

3.2 Genus *Papuaenis* **n. gen.**

Type species: *Papuaenis balkei* n. sp. by present designation.

Etymology

The genus name is a combination of P a p u a (New Guinea) where the genus was found, and C a e n i s .

Differential Diagnosis

Papuaenis n. gen. can be characterised and distinguished from all other genera of Caenidae by the following combination of characters:

L a r v a . Large parts of cuticle densely covered with shield-shaped microtrichia (Figs. 10, 15, 20). – With broad spatulate and frayed, sometimes tuft-shaped bristles of different length, arranged marginally on femora, tibiae, operculate gills etc. (Fig. 21). – Different types of frayed and comb-shaped bristles particularly on maxilla, labrum and fore tibia (Fig. 16). – Thorax broadened (Fig. 9). – Head without ocellar tubercles. – Outline of head with bulges in lateral view (Fig. 1m). – Clypeus slightly protruding anteriorly, without setation (Fig. 10). – Maxillary and labial palps three-segmented. – Fore tibia and fore tarsus without filtering setae. – Mid and hind tibia ventrally without numerous long bristles. – Gill I only about 0.2 the length of operculate gill. – Operculate gill ventrally with a row of simple scale-shaped microtrichia of different shape and size (Fig. 19). – Row not reaching hind margin of gill (Fig. 17). – Nearly all filaments of gill III 1- or 2-branched, only 1(–3) filaments with 3 or more branches. – Lateral spines of abdomen not bent dorsally. – Abdominal terga VII–IX with mediolongitudinal ridge (Fig. 9). – Posterior part of sternum IX shortened and cut (Fig. 1f), without a bi-pointed process with concave margin between the points.

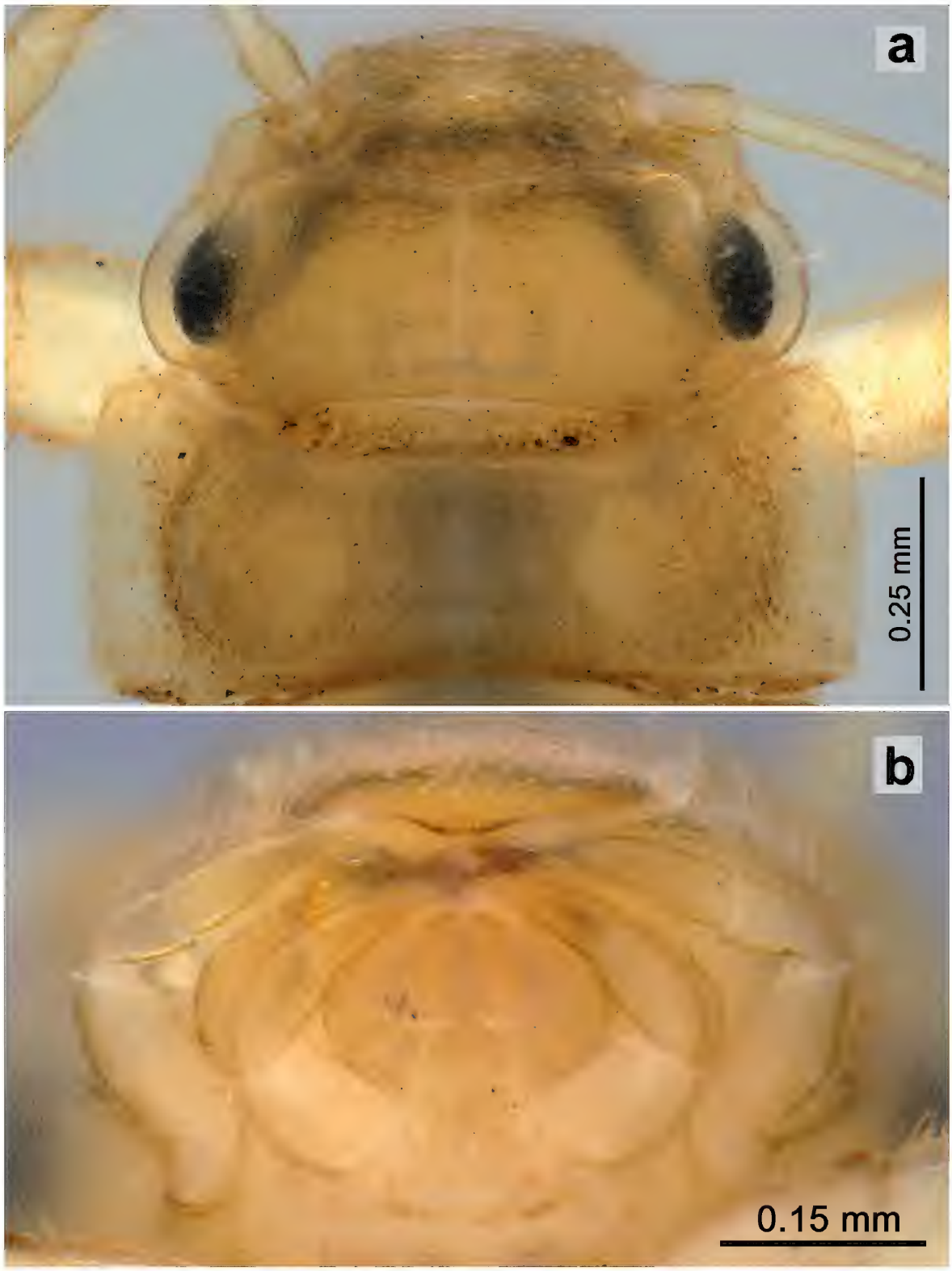
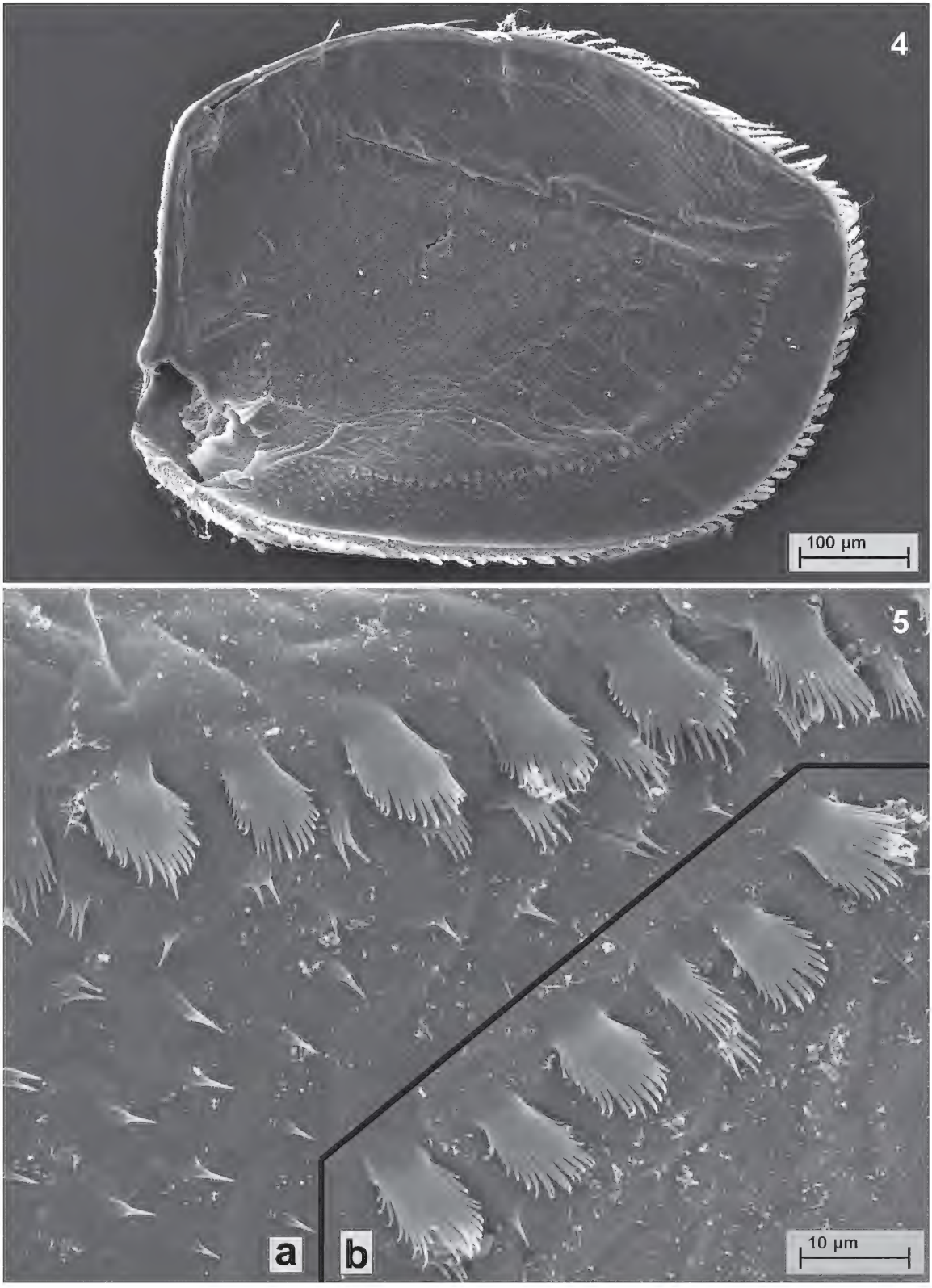
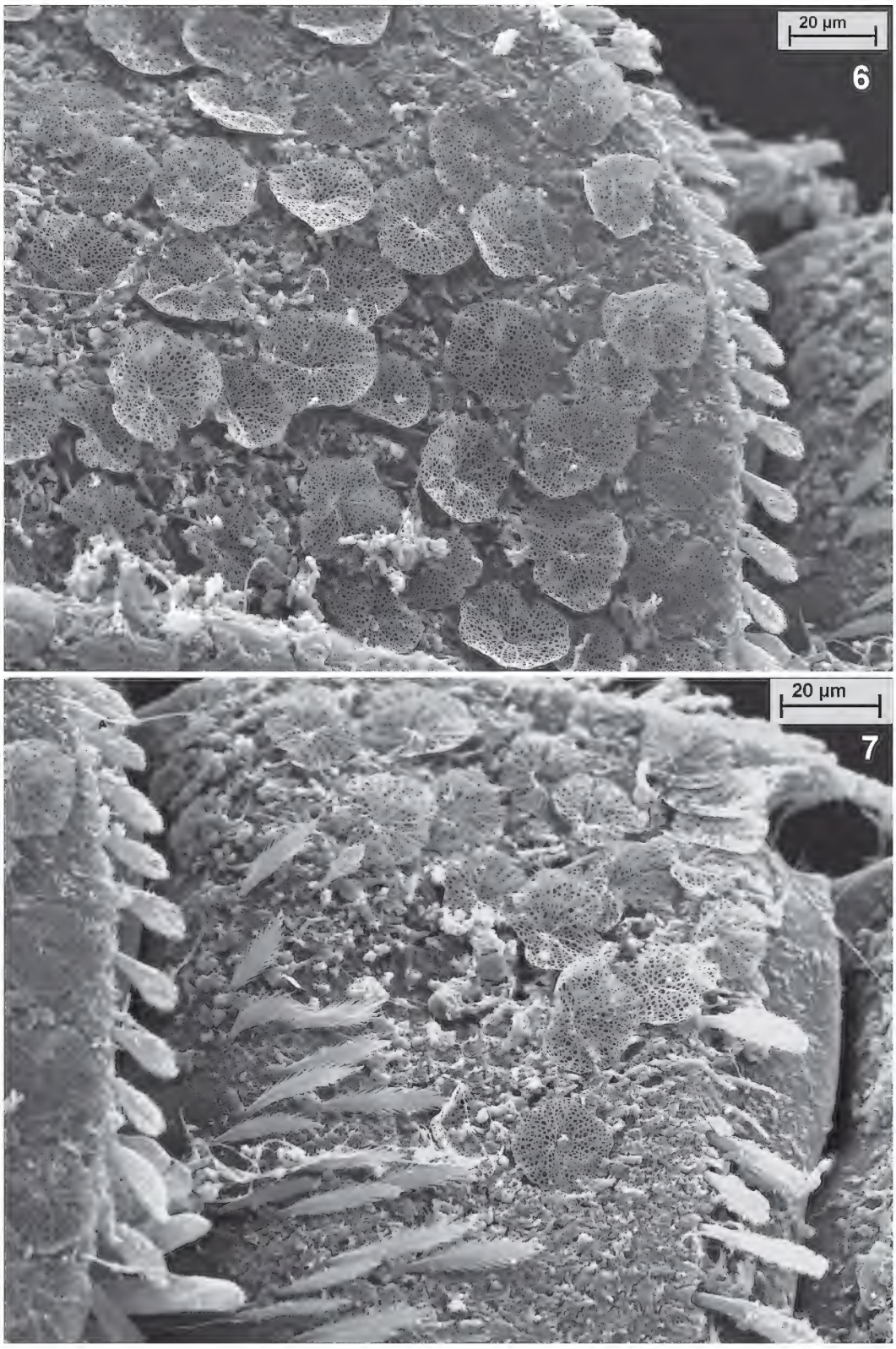


Fig. 3. *Mandelara immutata* n. sp., larva, head and pronotum (a), mouthparts (b).



Figs. 4–5. *Mandelara immutata* n. sp., larva, operculate gill. – **4**. Ventral view. **5**. Microtrichia from ventral side, sector from median part of the band (a) and near posterolateral corner (b).



Figs. 6–7. *Mandelara immutata* n. sp., larva. – **6**. Operculate gill, microtrichia on dorsal side. **7**. Sector from tergum VII.

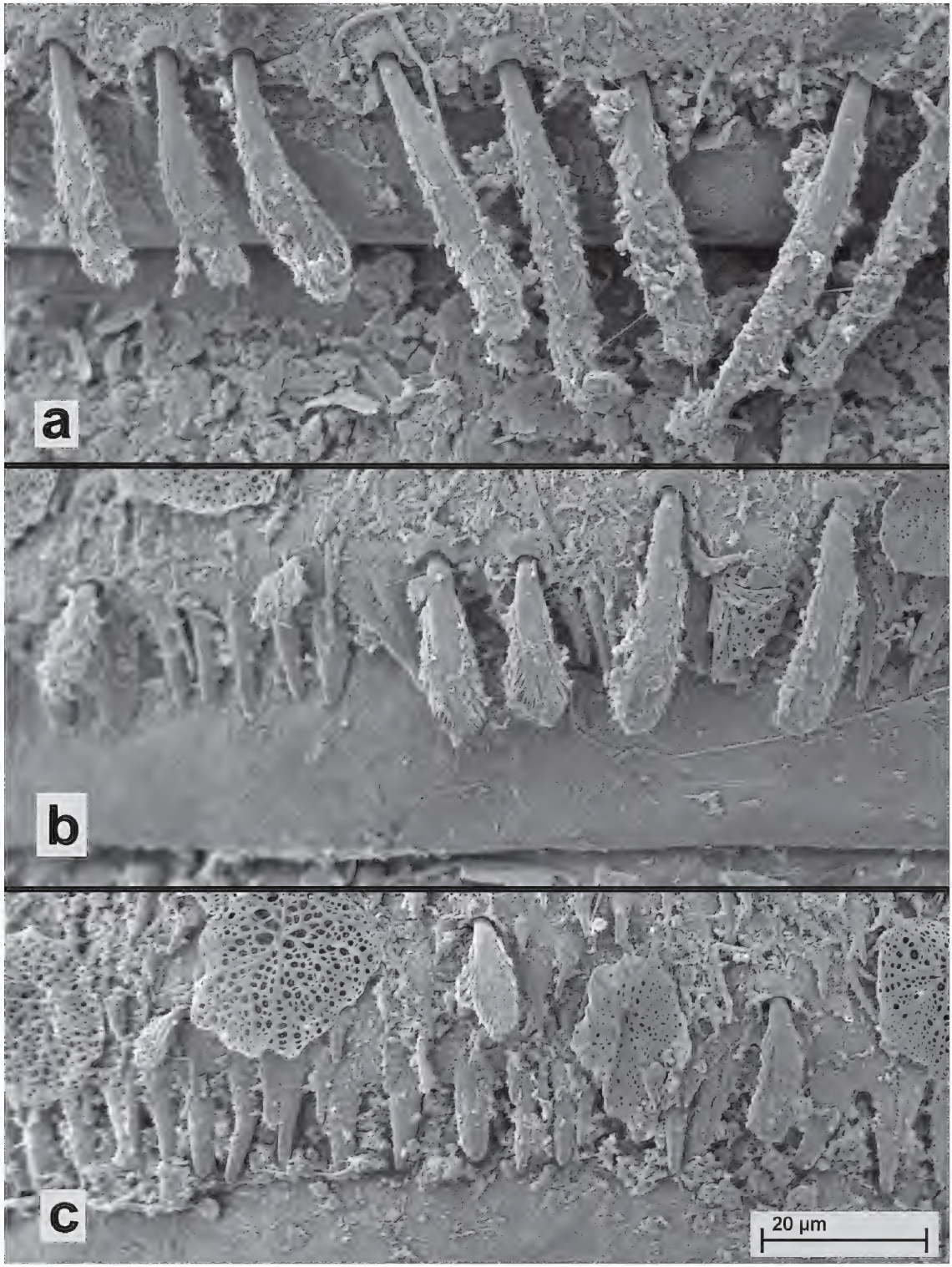


Fig. 8. *Mandelara immutata* n. sp., larva, sector from hind margin of tergum VII (a), VIII (b) and IX (c).

Egg. Epithemata very large, with single threads with tassel-shaped terminal knobs running along the meridians (Figs. 22, 23).

On the differences to other genera of the Clypeocaenini see the larval key below (section 4).

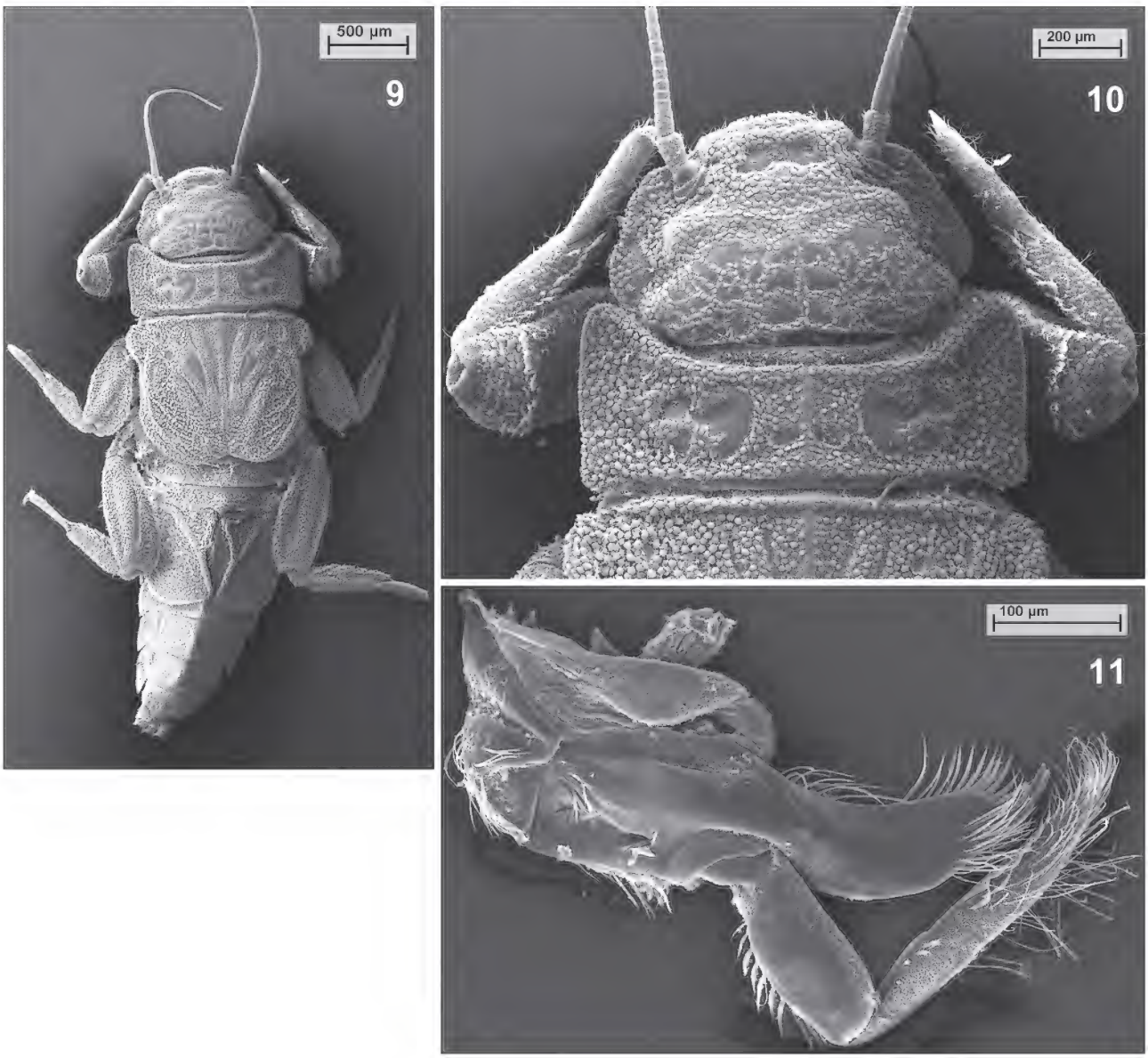
Papuaenis balkei **n. sp.**
(Figs. 1f–n, 9–24)

Holotype, ♂ larva (microslide): PNG 102, Papua New Guinea, Marobe, Wagau, Herzog Mts., 146°48′068″ E, 06°51′067″ S, 19.XI.2006, Balke & Kinibel leg.

Paratypes: PNG 87, Papua New Guinea, Eastern Highlands, Marawaka, Ande, 145°49′807″ E, 07°01′697″ S, 09.XI.2006, 1 ♀ larva, Balke & Kinibel leg. – PNG 90, Papua New Guinea, Gulf, Marawaka, Mala, 145°44′467″ E, 07°05′664″ S, 11.XI.2006, 2 ♀♀ larvae, Balke & Kinibel leg. – PNG 119, Papua New Guinea, Madang, Keki, Adalbert Mts., 145°24′437″ E, 04°43′058″ S, 29.XI.2006, 1 ♀ larva, Binatang Boys.

Etymology

The species is dedicated to the collector and leader of the Papua New Guinea expedition 2006, Michael Balke (Zoologische Staatssammlung München).



Figs. 9–11. *Papuaenis balkei* n. sp., larva. – **9**. Habitus. **10**. Head and pronotum. **11**. Maxilla.

Larva

Measurements and colouration

Subadult male larva, body length 3.5 mm, length of cerci 1.5 mm; subadult female larva, body length 4.2 mm, length of cerci 2.2 mm.

Colouration of cuticle: Beige. Head, pro- and mesonotum, operculate gills, and femora with a brownish shading, caused by the brown microtrichia.

Epidermal pigmentation: No pigments visible.

Morphology

Cuticle: Large parts of dorsal side densely covered with small, compact, shield-shaped microtrichia (Fig. 20). A conspicuous pattern of pale marks, blotches, and lines results from the lack of microtrichia on these places (Figs. 9, 10).

Head: Outline of head bulged in lateral view (Fig. 1m), clypeus slightly protruding anteriorly; genae strongly bulging out (Fig. 10). Mandibles with only one or two long bristles and a ventrobasal field densely covered with broad multi-branched bristles (as in Fig. 21a). Galealacinia apico-medially broadly rounded (Fig. 11). Segment 3 of maxillary palp ventrally with numerous very long, thin and medially shortly combed bristles; peeking out beneath them some broad comb-shaped bristles with very long and thin tips (Fig. 12). Segment 3 of labial palp about 0.8 times as long as segment 2 (Fig. 13). Postmentum with similar bristles as on maxilla (Fig. 21a).

Thorax: Sides of pronotum straight and parallel, sometimes fore corner laterally a little protruding and side slightly S-shaped; sides of mesonotum with broad rounded antero-lateral projections (Figs. 1n, 9). Femora broad and flattened (Fig. 14). Fore femur with a very dense transverse row of 15–18 bristles which are broadly spatulate, bifurcated and pinnate (Figs. 14a, 15). Coxal processes flatly semi-elliptical and slightly bulging out (Fig. 1i, j). Mid and hind legs marginally with similar bristles like that from the transverse row on fore femur (Fig. 14b). Tibiae with comb-shaped, unipinnate bristles (Fig. 16b), apically additionally with strongly bipinnate ones (Fig. 16a). There are a lot of different shapes from short and very broad bristles to those of moderate length and also transitional stages to tuft-shaped forms (fore tibia) (Fig. 21). Fore tarsus with an inner row of about 8 relatively long simple bristles. Mid tarsus with inner row of about 7 strong simple bristles. Hind tarsus with inner row of about 10 strong simple or slightly unipinnate bristles and an outer row of about 5 small and unipinnate bristles. Claws short and basally broad, with sides clearly converging anteriorly; apically bent, without denticles (Fig. 1k, l).

Abdomen: Posterolateral processes of moderate length (Fig. 1f–h). Posteromedian process of tergum II broadly triangular with rounded tip. Terga VII–IX with medio-longitudinal ridge (Fig. 9). Hind margin of tergum VII with short spatulate and pinnate bristles, VIII–X with long denticles apically more or less rounded. Tergum VII covered with spatulate bifid bristles that are slightly pinnate. Posterior part of sternum IX shortened and cut, sometimes medially slightly indented (Fig. 1f), dorsal shagreen not discernible. Gill I very short, about 0.2 the length of operculate gill. Lateral and hind margins of operculate gill with broadly spatulate and pinnate bristles (Fig. 18), inner margin with thin, pointed and finely frayed ones. Y-shaped ridge keeled, the inner branch a little stronger, with 3–4 short and strong bristles at the base. Row of microtrichia on ventral side of operculate gill running in regular distance from the lateral and hind margins, not reaching the latter (Fig. 17). The row consists of short and rounded simple microtrichia (Fig. 19). Gills III(–V) with only 1 filament with 3 branches; all the other filaments simple or two-branched.

Eggs

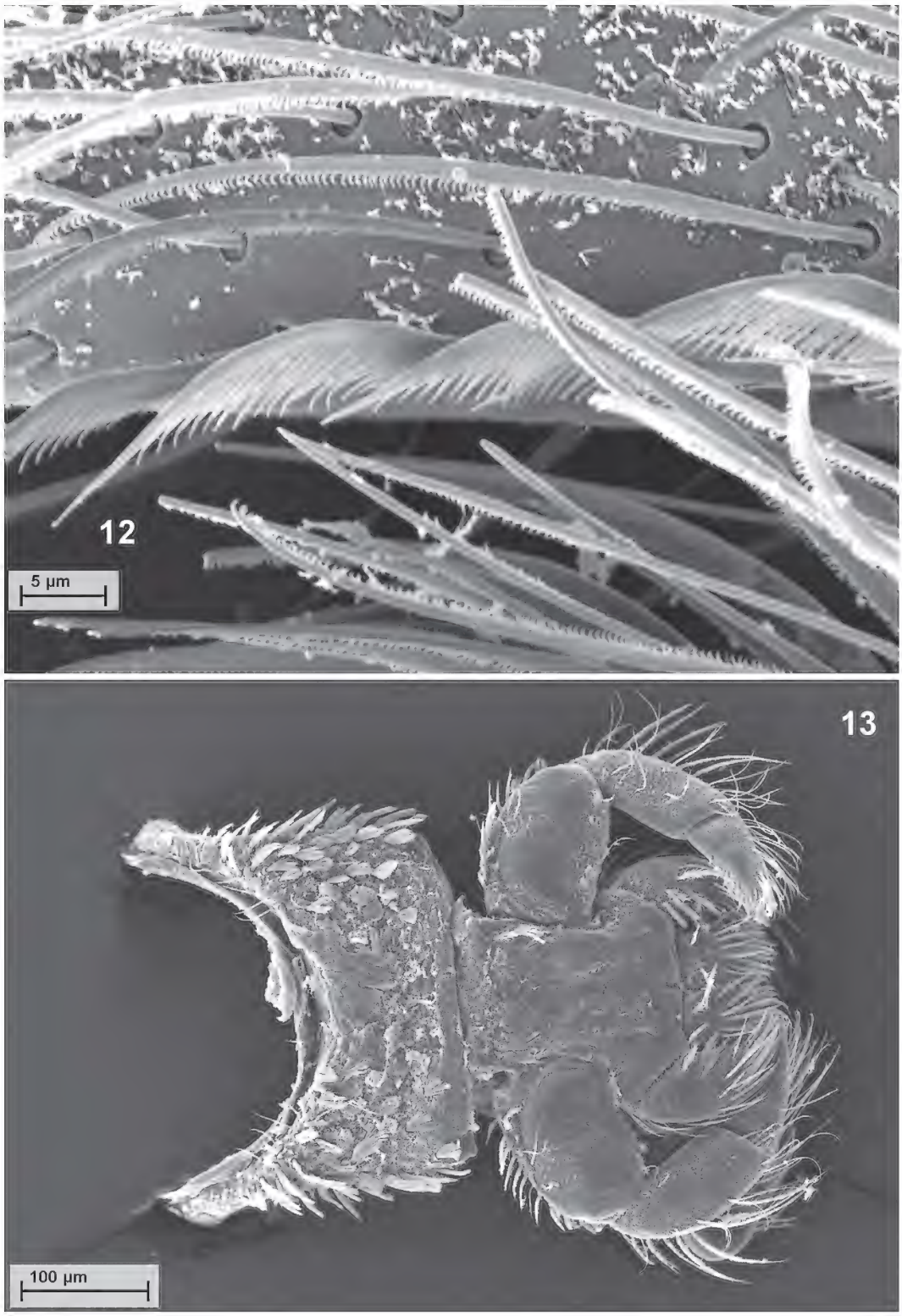
[The eggs were taken from a last instar female larva. In this developmental stage, parts of the egg surface, particularly the epithemata, are still covered by a thin protecting membrane.]

Eggs short oval or barbell-shaped. Chorion with irregularly distributed, wide pores (Fig. 24). Two large epithemata; except for a narrow equatorial area covering the whole egg surface (Figs. 22, 23), not corresponding to types of epithemata hitherto described for Caenidae. A large number of single threads, each with a terminal tassel-shaped knob, running from the polar region along the meridians towards the equator (single-thread-type). After dissolution of the protecting membrane threads floating in the surrounding water (Fig. 23b). One (or two?) micropyle(s) with a short or very short visible channel and a small, irregular sperm-guide (Fig. 24).

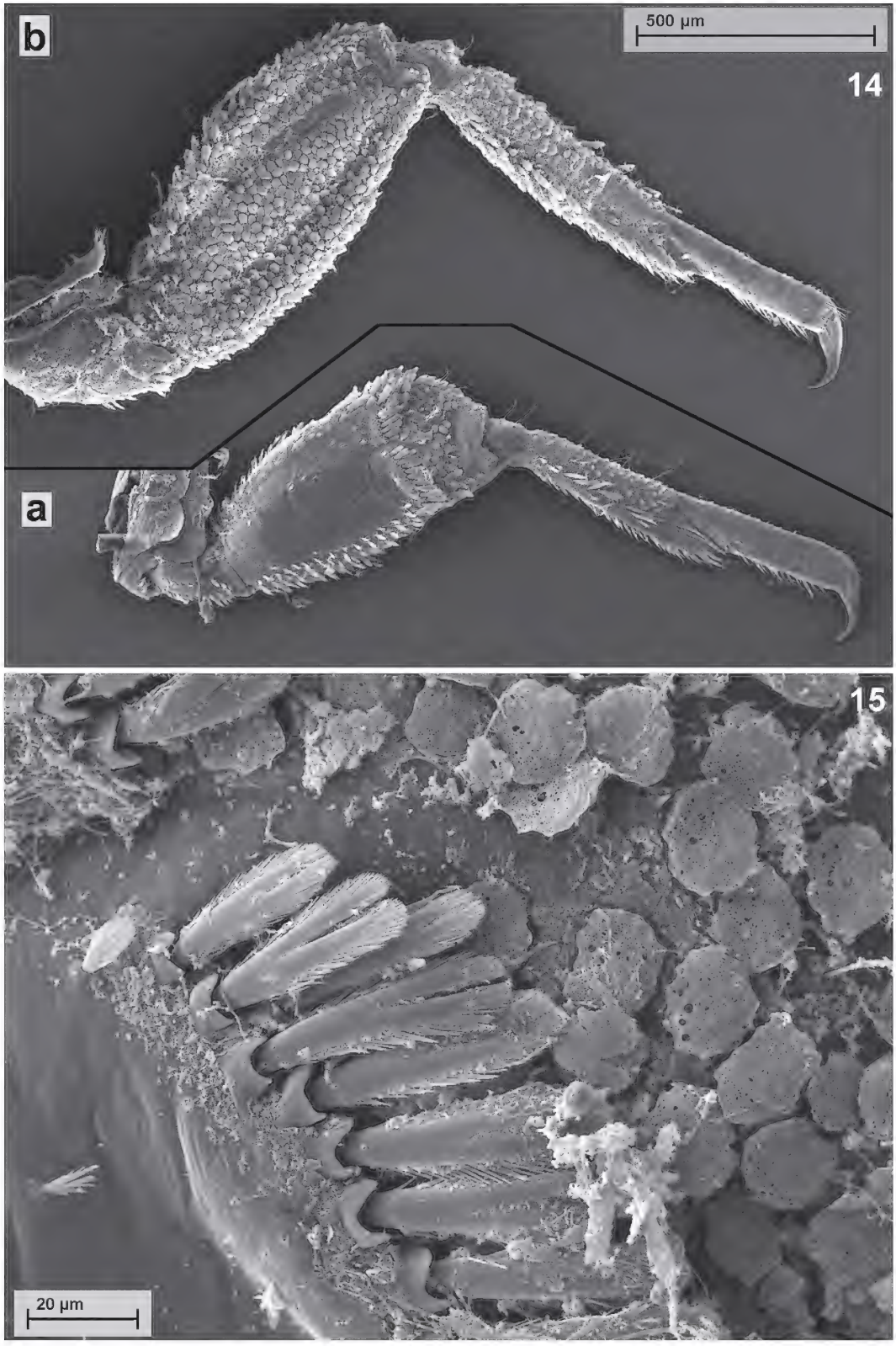
Imaginal stages unknown.

4 Larval key to the genera of Clypeocaenini

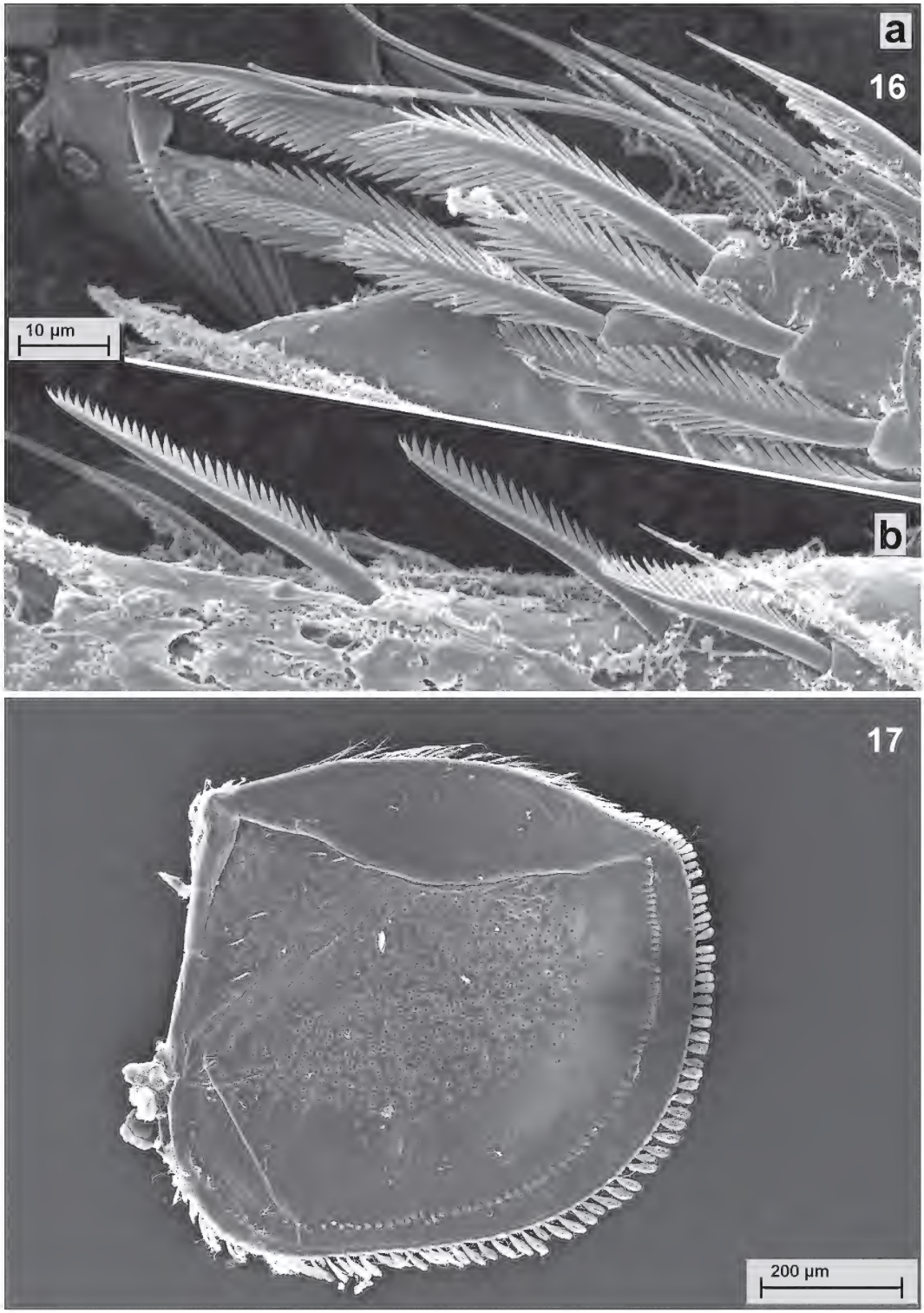
1 Fore tibia and fore tarsus with long filtering setae..... **2**
– Fore tibia and fore tarsus without filtering setae..... **5**
2 Filtering setae reaching to about half the length of tibia, densely arranged medially on fore tibia and fore tarsus. ..... ***Amercaenis***
– Filtering setae nearly as long as tibia, not densely arranged and also present laterally on tibia and tarsus..... **3**
3 Maxillary palp three-segmented. Body cuticle with strong long spines. Mid and hind tibia ventrally with numerous long bristles (Malzacher 2014: fig. 1c). ..... ***Provonshara***
– Maxillary palp two-segmented. Body cuticle without strong long spines. Mid and hind tibia ventrally without long bristles. **4**



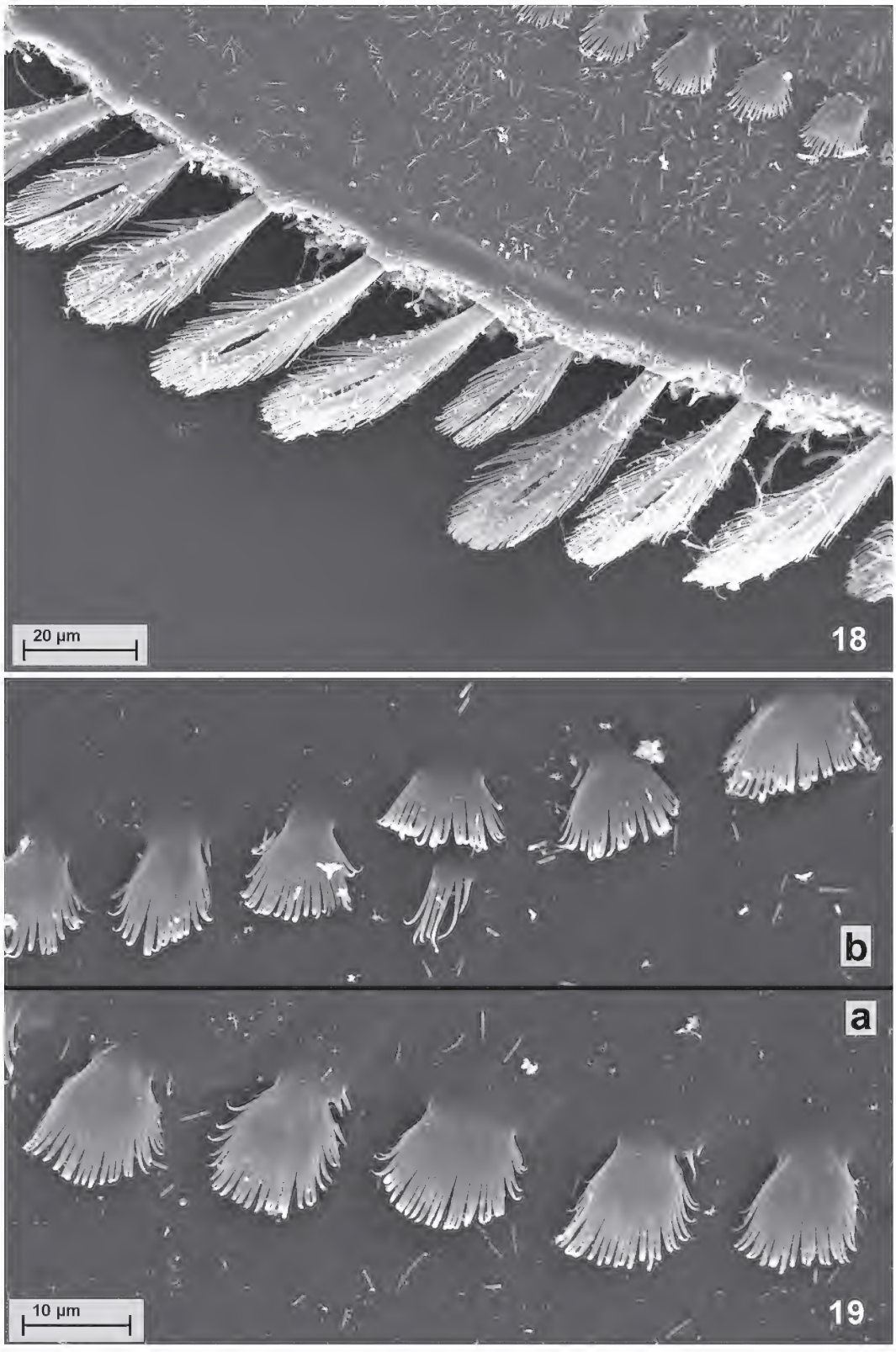
Figs. 12–13. *Papuaenis balkei* n. sp., larva. – **12**. Comb-shaped bristles from segment 3 of maxillary palp. **13**. Labium.



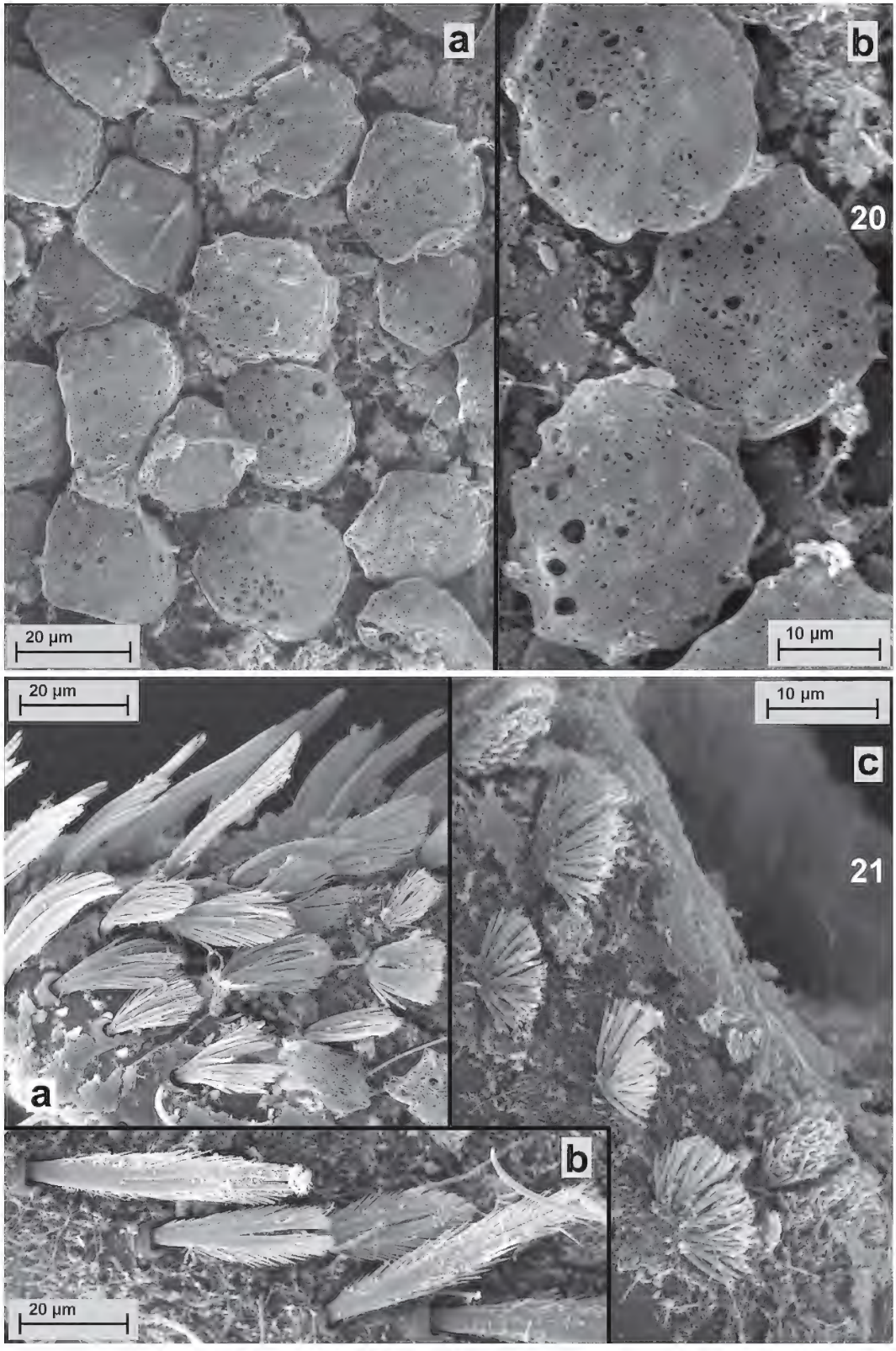
Figs. 14–15. *Papuaenis balkei* n. sp., larva. – **14**. Fore leg (a) and hind leg (b). **15**. Sector from transverse row of bristles on fore femur.



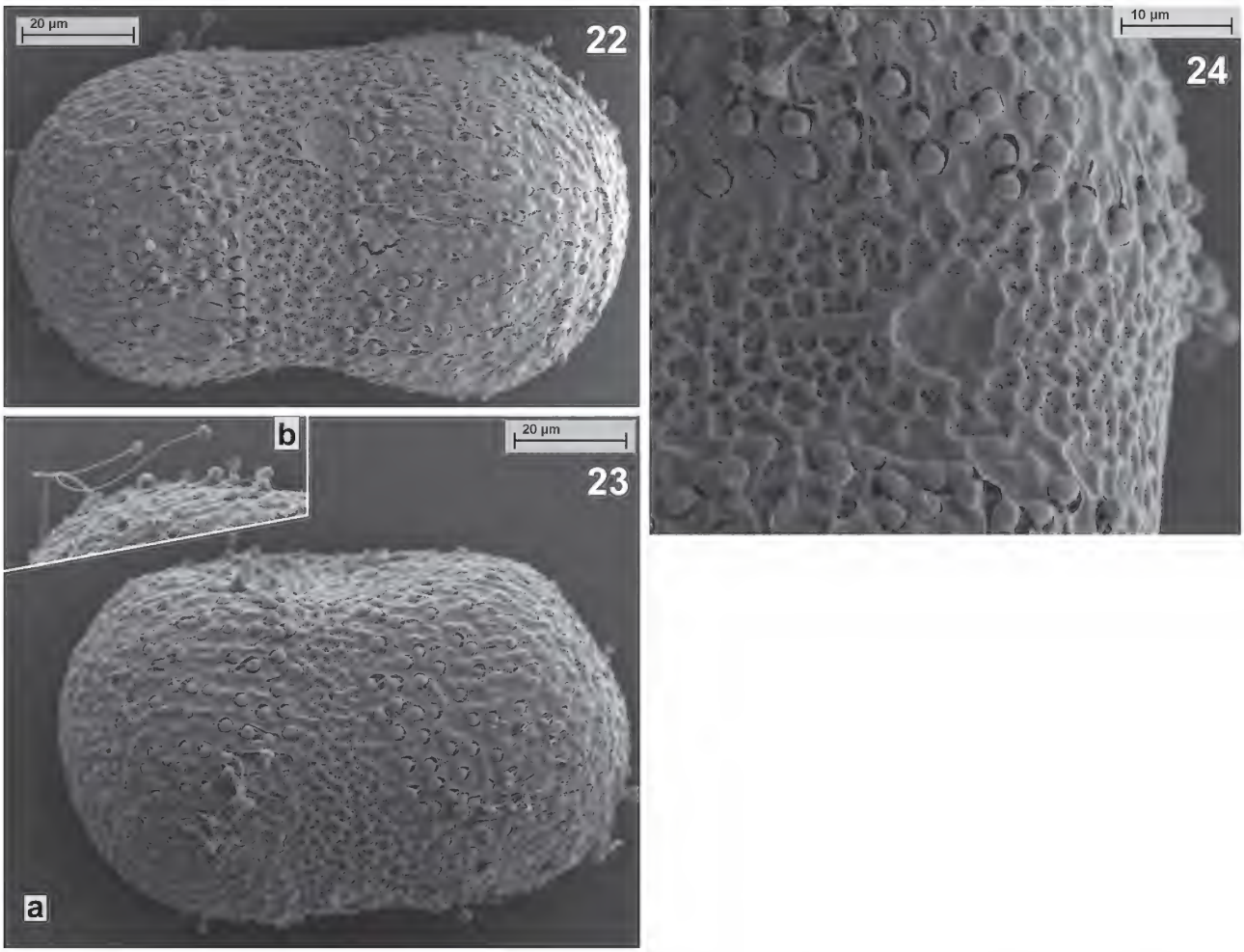
Figs. 16–17. *Papuaenis balkei* n. sp., larva. – **16**. Different bristles from fore tibia, apical protrusion (a), inner margin (b). **17**. Operculate gill, ventral view.



Figs. 18–19. *Papuaenis balkei* n. sp., larva, operculate gill. – **18**. Bristles from lateral margin. **19**. Microtrichia from ventral side, sector from median part (a) and from basal part (b) of the row.



Figs. 20–21. *Papuaenis balkei* n. sp., larva. – **20**. Microtrichia from dorsal cuticle (a), in higher magnification (b). **21**. Different bristles, from postmentum (a), fore tibia (b) and fore femur (c).



Figs. 22–24. *Papuaenis balkei* n. sp., eggs. – **22**. Barbell-shaped egg. **23**. More rounded egg (a), floating threads (b). **24**. Micropyle.

4 Filtering setae forming regular rows (Provonsha & McCafferty 1995: fig. 16). Clypeus anteriorly strongly protruding, with long setae..... ***Clypeocaenis***
– Filtering setae irregularly arranged (Provonsha & McCafferty 1995: fig. 5). Clypeus anteriorly without long setae..... ***Barnardara***
5 Legs long and slender, femora narrowed (Malzacher 2013: fig. 8b–d). Maxillary palp elongated and coiled (Malzacher 2013: fig. 12a). Mesonotum not broadened..... ***Kalimaenis***
– Legs not elongated, femora broad. Maxillary palp shorter and not coiled. Mesonotum broad, outline of body more or less evenly curved..... **6**
6 Great parts of cuticle densely covered with shield-shaped microtrichia (Figs. 6, 20)..... **7**
– Cuticle without densely arranged shield-shaped microtrichia..... **8**
7 Sternum IX posteriorly shortened, hind margin straight (Fig. 1f). Claws short, without denticles (Fig. 1k–l)..... ***Papuaenis***
– Sternum IX not shortened, hind margin bowed, with median incision (Fig. 1a). Claws longer, with about 12 denticles (Fig. 1d)..... ***Mandelara***
8 Body surface provided with many very long hair-like bristles (Malzacher 2009a: fig. 4). Thoracic notae smooth..... ***Trichocaenis***
– Body surface without long bristles. Thoracic notae with ridges or bulges (Sun & McCafferty 2001: fig. 1)..... ***Callistellina***

5 Cladistic analysis

For data matrix see Tab. 1. Characters used for cladistic analysis are as follows:

1 (I) Mesonotal ommation: **(0)** absent; **(1)** present.
2 (I, L) Hind wing (buds): **(0)** present; **(1)** absent.
3 (I) Segmentation of forceps: **(0)** 4-segmented; **(1)** 1-segmented.
4 (I, L) Styliger (anlagen): **(0)** fully exposed; **(1)** partly retracted into abdominal segment IX.
5 (I) Procoxae: **(0)** broadly separated; **(1)** approximated.

Tab. 1. Data matrix for 14 species of Caenidae and *Neoephemera youngi* (Neoephemeridae).

	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Neoephemera youngi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Madecocercus tauroides	1	1	1	1	0	0	1	1	1	2	3	3	2	1	0	0	0	2	0	0	1	1	0	0
Brachycercus harrisella	1	1	1	1	0	0	1	1	1	2	1	2	1	1	0	0	0	1	1	2	1	1	0	0
Caenoculis bishopi	1	1	1	1	0	0	1	1	1	4	2	1	0	1	0	0	0	0	0	1	1	1	0	0
Trichocaenis inexperta	?	1	?	?	?	?	?	1	1	1	3	0	0	1	0	1	1	0	0	0	1	1	1	0
Mandelara immutata	?	1	?	?	?	?	?	1	1	2	3	0	0	1	0	1	1	0	0	0	1	2	1	1
Papuaenis balkei	?	1	?	?	?	?	?	1	1	3	3	0	0	1	0	1	1	0	0	0	1	2	1	1
Callistellina panda	?	1	1	1	?	?	?	1	1	2	3	0	0	0	0	1	1	0	0	0	1	2	1	0
Provonshara spinifera	?	1	?	?	?	?	?	1	1	2	3	0	0	1	2	1	1	0	0	0	1	2	1	0
Barnardara demoori	?	1	?	?	?	?	?	1	1	2	3	0	0	0	2	1	1	1	0	0	1	2	1	0
Clypeocaenis oligosetosa	1	1	1	1	1	1	0	1	1	2	3	0	0	0	3	1	2	1	0	0	1	3	1	0
Amercaenis ridens	1	1	1	1	1	1	0	1	1	3	2	0	0	0	1	1	1	0	0	0	1	2	1	0
Kalimaenis sibylliana	1	1	1	1	1	1	0	1	1	3	2	0	1	0	0	1	1	0	0	0	1	2	0	0
Caenis macrura	1	1	1	1	1	1	0	1	1	3	1	0	0	0	0	0	0	0	0	0	2	1	0	0
Tasmanocoenis tillyardi	1	1	1	1	1	1	1	1	1	3	1	0	0	0	0	0	0	0	0	0	2	1	0	0

6 (I) Metathorax: **(0)** without transversal ridge; **(1)** with transversal ridge.

7 (I) Shape of forceps: **(0)** without ridges or keels; **(1)** with longitudinal ridge; **(2)** with single ventral longitudinal groove; **(3)** with dorsal and ventral longitudinal groove.

8 (L) Gill cover medially: **(0)** not overlapping; **(1)** overlapping.

9 (L) Gill cover: **(0)** bilobed; **(1)** without ventral lobe.

10 (L) Ventral side of gill cover: **(0)** without microtrichia; **(1)** with field of irregularly arranged microtrichia; **(2)** with band of irregularly arranged microtrichia; **(3)** with single row of regularly arranged microtrichia; **(4)** with transverse rows of regularly arranged microtrichia.

11 (L) Gill III with multiple branchings: **(0)** in nearly all filaments; **(1)** in 15–25 filaments; **(2)** in about 8 filaments; **(3)** in 1–3 filaments.

12 (L) Abdominal posterolateral projections in abdominal segments: **(0)** (2)3–9; **(1)** 4–7; **(2)** 3–7; **(3)** 2, 5–9.

13 (L) Femora: **(0)** broad and stout; **(1)** thin and elongated; **(2)** extremely broadened and stout.

14 (L) Profemora dorsally: **(0)** with transverse row of setae; **(1)** without transverse row of setae.

15 (L) Protibiae: **(0)** without filter setae; **(1)** with irregularly arranged short filter setae; **(2)** with irregularly arranged long filter setae; **(3)** with regularly arranged rows of filter setae.

16 (L) Outline of head: **(0)** evenly bowed; **(1)** bulged.

17 (L) Clypeus anteriorly: **(0)** not protruding; **(1)** slightly protruding; **(2)** heavily protruding.

18 (L) Maxillary palps: **(0)** 3-segmented; **(1)** 2-segmented; **(2)** 1-segmented.

19 (L) Labial palps: **(0)** 3-segmented; **(1)** 2-segmented.

20 (L) Ocelli: **(0)** without tubercles; **(1)** with small tubercles; **(2)** with large tubercles.

21 (L) Operculate gill, ventral row of microtrichia: **(0)** lacking; **(1)** not reaching hind margin; **(2)** reaching hind margin.

22 (L) Operculate gill, medial ridge on dorsal side: **(0)** absent; **(1)** not keeled; **(2)** keeled; **(3)** extremely keeled.

23 (L) Mesonotum: **(0)** not broadened, laterally with distinct angle to abdomen; **(1)** broadened, laterally confluent with abdomen.

24 (L) Shield-shaped microtrichia on cuticle: **(0)** absent; **(1)** present.

6 Phylogenetic discussion

The cladistic analysis confirmed the monophyly of Caenidae, which was unchallenged before. Within Caenidae, the Brachycercinae + Madecocercinae were recovered as sistergroup to the monophyletic Caeninae. Within Caeninae, the Caenini + Tasmanocoenini and Clypeocaenini were recovered as well-supported sistergroups.

Within Clypeocaenini, *Kalimaenis sibylliana* branches off first, followed by *Amercaenis ridens*. The remaining genera within Clypeocaenini form a weakly supported monophyletic group. Within this group, however there are two well supported monophyla, namely *Papuaenis balkei* + *Mandelara immutata* and *Provonshara spinifera* + (*Clypeocaenis oligosetosa* + *Barnardara demoori*). The positions of *Callistellina panda* and *Trichocaenis inexperta* in relation to these other two groups remain unresolved (see Fig. 25). For apomorphies determined in the cladistic analysis see Fig. 26.

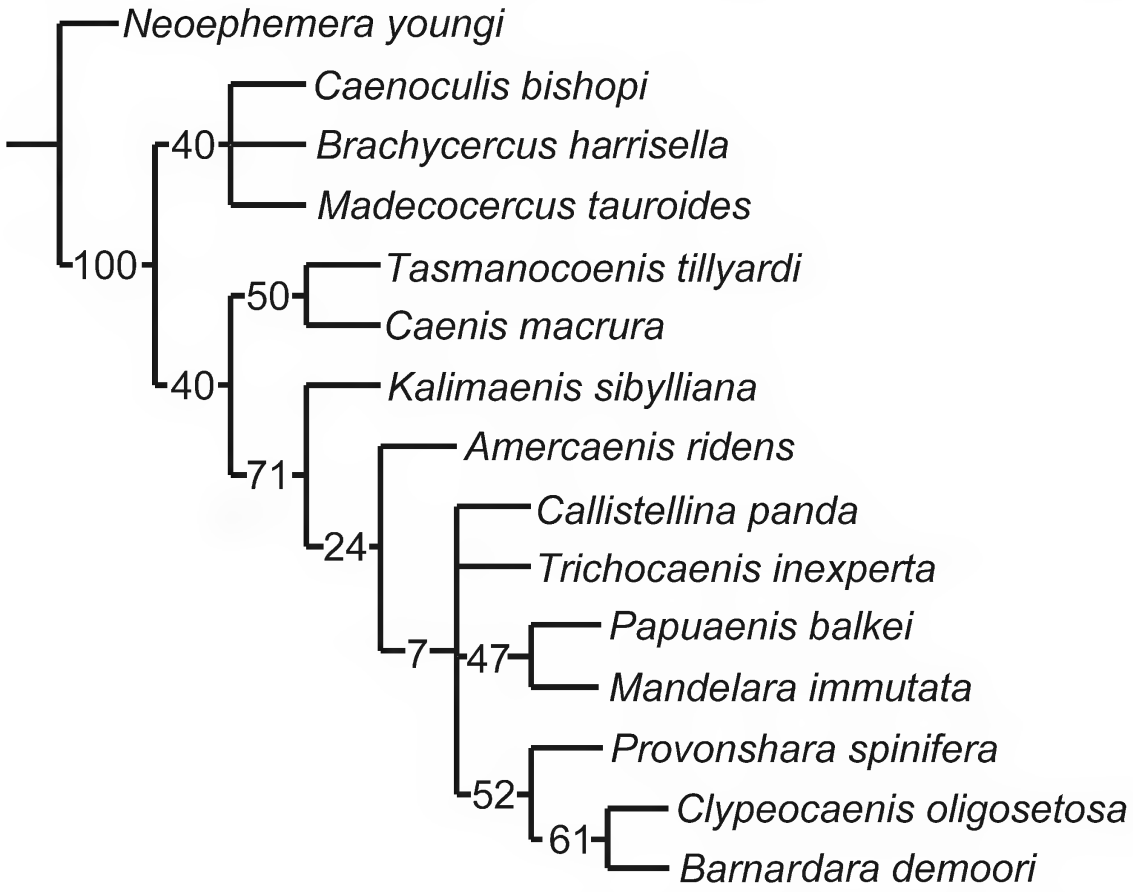


Fig. 25. Cladistic analysis of Clypeocaenini, Strict Consensus, Jacknifing (P = 36). – GC Values, 10000 replicates, cut = 1 (tree 0).

The cladistic analysis confirms the mental analysis due to Phylogenetic Systematics sensu Hennig (1966) that results in the very same phylogeny (based on larval characters).

Due to mental analysis (Fig. 27), the genera of the tribe Clypeocaenini share two synapomorphies:

(1) Gill III (first of the four respiratory gills) possesses at most eight filaments (in most cases only one or two), each made up of three or more branches, in contrary to 15–25 filaments in the Caenini and Tasmanocoenini (character 11). In the outgroup Neoephemeridae there are numerous filaments present, each with 5 and more branches, so that a reduction of filament branches can be regarded as apomomorphic for Clypeocaenini.

(2) Outline of head in lateral view with bulges, clypeus more or less protruding (character 14, see also Malzacher 2013: fig. 13c–h). In the above mentioned outgroups and in Ephemerellidae the outline of the head in lateral view is evenly bowed (Malzacher 2013: fig. 13a, b).

The sister group of Clypeocaenini, represented by the tribes Caenini + Tasmanocoenini shares two synapomorphies:

(3) Row of microtrichia on ventral side of gill II (operculate gill) extends to hind margin of gill (character 21; for Caenini see Malzacher 2009b: figs. 17, 20 and 23; for Tasmanocoenini see Suter 1984: fig. 6, Alba-Tercedor & Suter 1990: fig. 19, Suter 1993: figs. 16, 41 and 68, and Suter 1999: fig. 95). In Clypeocaenini, the row of microtrichia does not extend to hind margin of operculate gill. The distance from the end of the row to hind margin varies from $^1/_8$ to $^1/_{15}$ the length of gill II (Figs. 4, 17).

(4) Gill II with regular row of complex, very similar, scale-shaped microtrichia, which are semicircular or more or less elongated, consisting of 20–30, rather basally fused filaments or spines (character 10). In *Kalimaenis*, a similar arrangement is present, but this is regarded as a convergent development. The plesiomorphic character states in Clypeocaenini show very different developmental stages from a band of simple spines and clusters of spines up to scales with 5–20 filaments arranged in an irregular row

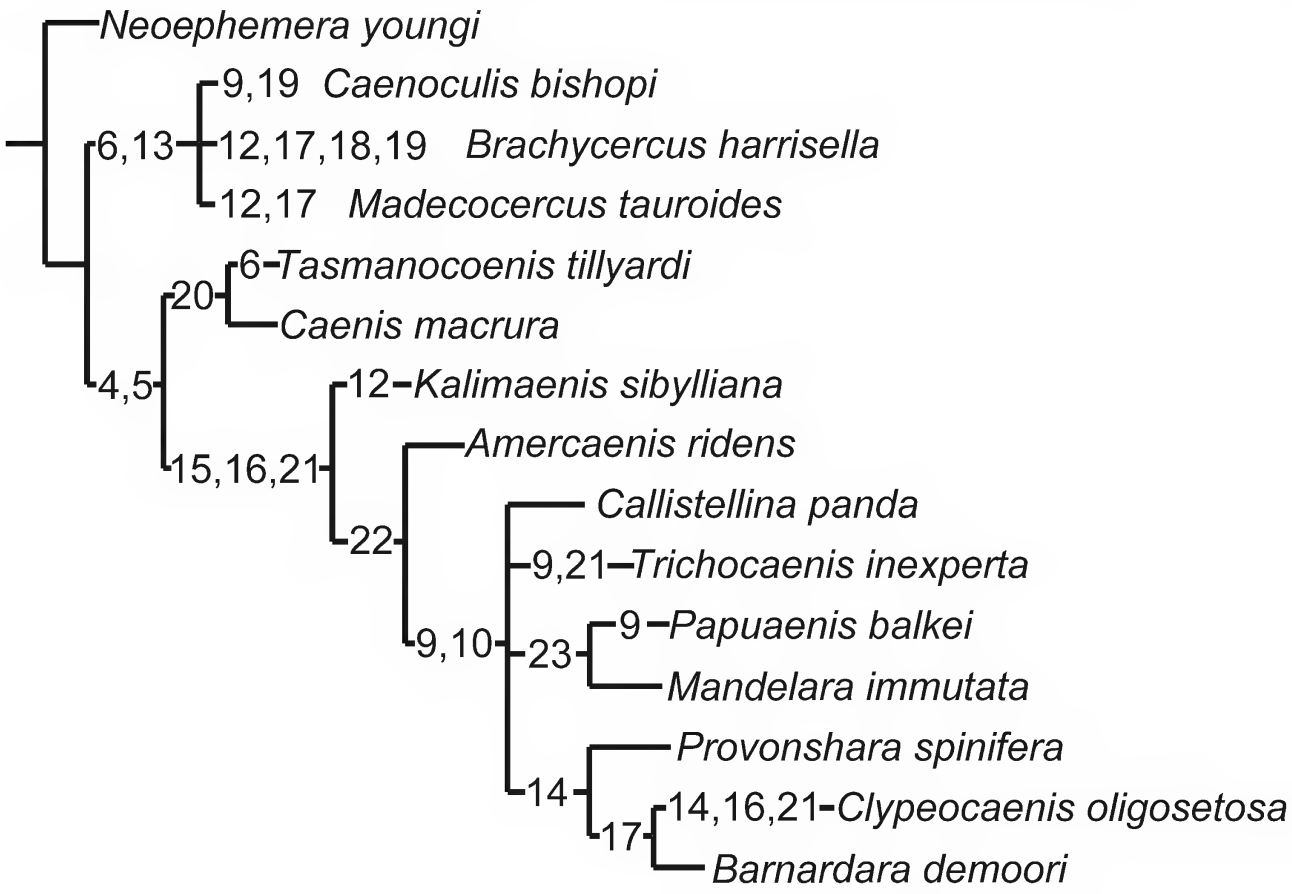


Fig. 26. Apomorphies of cladistic analysis. – Synapomorphies common to three trees.

(Malzacher 2009b: figs. 3–5, 8, 10, 12). The most plesiomorphic state, simple spines and clusters of spines, can also be found in Brachycercinae and Madecocercinae. In the outgroup Neoephemeridae there are no ventral microtrichia present at all.

Within Clypeocaenini the genus *Kalimaenis* branches off from the remaining genera that share a single apomorphic character (character 23):

(6) Mesonotum broad. Pronotum broadly attached to the mesonotum (Figs. 2, 9). Outline of body more or less evenly curved. (e. g. Malzacher 2013: fig. 47, Malzacher 2009a: fig. 4; Sun & McCafferty 2001: fig. 1). In *Kalimaenis*, the pro- and mesonotum is much narrower. In Malzacher 2013 and 2014 this was established erroneously also for *Amercaenis*, but it turns out that the mesonotum of the latter is clearly broader.

Kalimaenis shows three autapomorphies:

(8) Legs long and slender (character 13), particularly in the females, with narrow femora more or less parallel-sided (Malzacher 2013: fig. 8b–d). This shape shows a certain similarity to legs of Brachycercinae. The fore legs of *Kalimaenis* are reduced in length just like in the latter subfamily.

Two further characters were not included in the cladistic analysis, but are clearly autapomorphies of *Kalimaenis*:

(9) Maxillary palps strongly elongated and narrowed with a conical segment 1 and S-shaped coiled segments 2 and 3 (Malzacher 2013: fig. 12a). As far as we know, this shape is unique in the Caenidae or even in the Pannota, where a tendency of reduction can be observed in all families. Only in *Tricorythus* a long and slender maxillary palp can be observed, but it shows only two segments (McCafferty & Wang 2000: fig. 85).

(10) Hind claws with about seven groups of micro-denticles. The micro-denticles in each group are fused together to larger denticles, respectively (Malzacher 2013: fig. 8e, f). In the Caeninae there can be homodont or heterodont hind claws present. The former are equipped with a number of denticles equal in size, whereas the latter have an additional row of more or less fused microdenticles (e. g.

MALZACHER 2009a: figs. 1p, 2h, 3g), a state that is apomorphic in some Caenini but cannot be found in the Clypeocaenini. On the other hand there is at least one *Caenis* species that shows a long row of fused microdenticles only (MALZACHER, in preparation). Nevertheless groups of fused micro-denticles are unique in *Kalimaenis*.

In the next step *Amercaenis* branches off from the *Clypeocaenis* group s. str. that shares the following apomorphy:

(5) In gill III nearly all filaments (up to 45) have one or two branches (character 11). Only one or two apical filaments show three or more branches. These are situated at the apex of the gill (MALZACHER 2014: fig. 1k). In *Kalimaenis* and *Amercaenis* there are 7–8 filaments with up to 5 branches and only about 20 reduced ones.

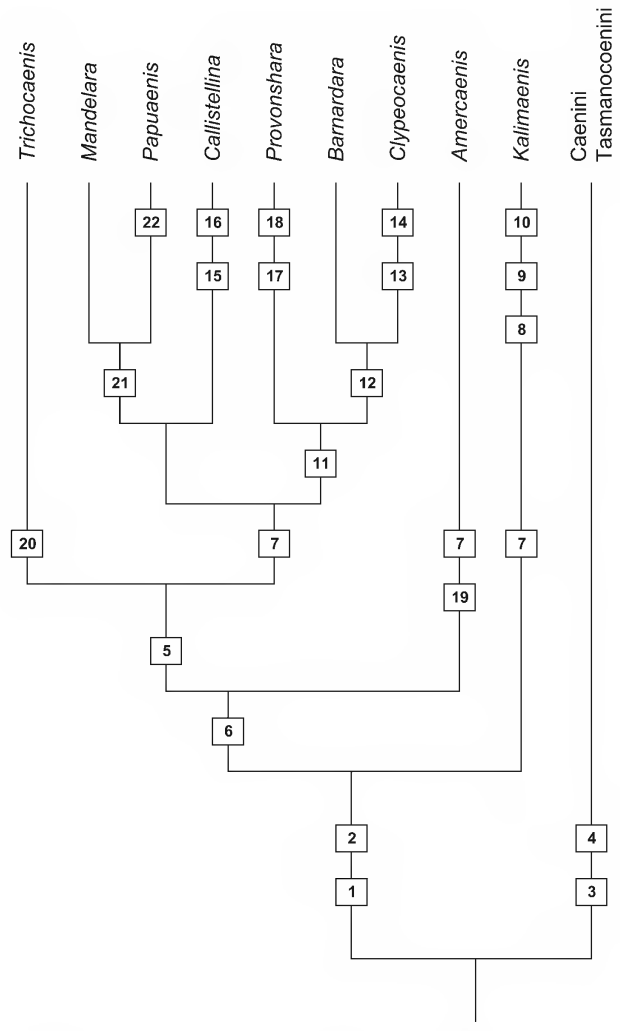


Fig. 27. Phylogenetic tree concluded by mental analysis with indicated apomorphies (see section 6 for detailed discussion on characters).

Amercaenis shows the apomorphic character:

(19) Densely arranged short filtering setae medially on tibia and tarsus of fore leg. This arrangement can only be found in Nearctic species and represents a parallel development to the African and Oriental genera with filtering setae.

The remaining genera of Clypeocaenini split into four groups: *Trichocaenis*, *Callistellina*, *Mandelara* + *Papuaenis*, and *Provonshara* + (*Barnardara* + *Clypeocaenis*). The phylogenetic relationship of these four groups to each other remains unresolved.

All Clypeocaenini except for *Trichocaenis* show the character:

(7) Gill II with a keeled inner ridge (character 22; see also MALZACHER 2013: figs. 9d, 43, and PROVONSHA & MCCAFFERTY 1995: fig. 7). A keeled ridge is also present in some taxa of Caenini. It may be possible that this character has evolved independently in these groups, or it is even possible that it is present in their common groundplan, but reduced in *Trichocaenis* and most Caenini.

Trichocaenis shows the following apomorphic character:

(20) Body surface provided with a lot of very long hair-like bristles. This character is unique within the Clypeocaenini and otherwise can only be found in a few Caenini. Thus we conclude that this character has evolved independently in *Trichocaenis* and a few Caenini.

Callistellina is well-defined by the following two apomorphies:

(15) Head with microscopic pits each with a hand-shaped microtrichium (SUN & MCCAFFERTY 2001: figs. 9 and 10; MALZACHER 2009a: fig. 10).

(16) Thoracic notae with ridges or bulges (SUN & MCCAFFERTY 2001: fig. 1). A single medio-longitudinal ridge is also visible in *Kalimaenis* (MALZACHER 2013: fig. 32).

Mandelara and *Papuaenis* share the following synapomorphic character:

(21) Great parts of cuticle densely covered with shield-shaped microtrichia often overlapping themselves with their margins (Figs. 6, 20). Shield or funnel-shaped microtrichia seem to have developed independently in several *Caenoculis* (MALZACHER, in preparation) and *Caenis* species.

Papuaenis shows one apomorphic character:

(22) Sternite IX posteriorly shortened, hind margin straight, not projecting beyond the posterolateral processes anteriorly. Such a shortening cannot be observed in other Caenidae.

At present, *Mandelara* cannot be defined by derived characters.

The *Clypeocaenis* group with the genera *Clypeocaenis*, *Barnardara* and *Provonshara* shares the following synapomorphy:

(11) Filtering setae on tibia and tarsus of fore leg. This is a parallel development to similar structures in *Amercaenis* (see character 9), but filtering setae are not arranged as densely as in *Amercaenis* and can also be found on the lateral part of tibia and tarsus, reaching more or less the length of tibia (SOLDÁN 1978: fig. 8, PROVONSHA & MCCAFFERTY 1995: figs. 5, 16). In *Amercaenis*, on the other hand, filtering setae reach only a little more than half the length of tibia (PROVONSHA & MCCAFFERTY 1985: fig. 6, and 2006: fig. 5).

Provonshara is the sister to *Clypeocaenis* + *Barnardara*. The latter are united by a single apomorphy:

(12) Maxillary palp two-segmented. This character can also be observed as parallel development in the Brachycercinae and some families of the Pannota (see MCCAFFERTY & WANG 2000 and KLUGE 2004).

Barnardara is not defined by unique apomorphic characters, while *Clypeocaenis* shows two apomorphies:

(13) Filtering setae arranged in rows. Few setae also often on inner margin of femur and in a basket-like arrangement on mandible (SOLDÁN 1978: fig. 8, PROVONSHA & MCCAFFERTY 1995: figs. 13, 16).

(14) Clypeus strongly protruding and provided with long setae.

Provonshara has two unique apomorphies:

(17) Body cuticle with strong long spines (MALZACHER 2014: fig. 2c). In all other Caeninae the cuticle is smooth, granulated, or shows short microdenticles (in *Kalimaenis* strongly granulated or scaly).

(18) Mid and hind tibia with numerous long bristles on ventral side (MALZACHER 2014: fig. 1c). In other genera those bristles are not present. If at all, long bristles occur only on dorsal side or on the margins of tibia.

It is noteworthy that both cladistic and mental analyses end up with identical phylogenetic hypotheses. In summary, it can be concluded that Clypeocaenini form a well-defined monophyletic group within Caeninae.

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Two new *Caenis* species from north-eastern China (Insecta: Ephemeroptera)

Peter Malzacher

Abstract

The new mayflies *Caenis wui* **n. sp.** and *C. pekinensis* **n. sp.** from China (Beijing) are described and compared with West and Central Palaearctic species (*C. robusta* and species of the *C. beskidensis* group).

Keywords: Caenidae, *Caenis*, Palaearctic, Beijing, Ulmer collection.

Zusammenfassung

Zwei neue Eintagsfliegenarten aus China (Peking), *Caenis wui* **n. sp.** und *C. pekinensis* **n. sp.**, werden beschrieben und mit west- und zentralpaläarktischen Arten verglichen (*C. robusta* und Arten der *C. beskidensis*-Gruppe).

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1 Introduction

Within the bounds of an investigation of the Caenidae in the collection Georg Ulmer (1877–1963) deposited in the Museum of the University of Hamburg, I examined also samples with *Caenis* specimens from the surroundings of Beijing, collected by C. F. Wu. In two cases visible subimaginal genitalia allow the description of new species. From China, six species of *Caenis* are so far described (Zhou & Zheng 2004, Jia et al. 2010), but they can be well distinguished from the herein described species. Unfortunately no dates are given on the labels, but it seems very likely that the material described below was part of the material which is mentioned by Ulmer (1936). Ulmer states that mayflies in alcohol were sent to him by Wu "in den letzten Jahren" [during the last years], that the collector donated the majority of the material to him, and that part of it remained unidentified. Most of Wu's material is cited without exact calendar dates also in Ulmer's article, but at least in two cases the years 1929 and 1930 are given. Wu has worked in Beijing since 1926.

Acknowledgements

My special thanks go to the colleagues from the Zoologisches Museum Hamburg, in particular to Kai Schütte for leaving me the material for investigation. Thanks also to Susanne Leidenroth for making the SEMs and to Arnold H. Staniczek (both Staatliches Museum für Naturkunde, Stuttgart) for useful comments on the manuscript.

2 Material and methods

The examined material is preserved in 75% ethanol. The types of the herein described species are deposited in the Zoologisches Museum, Hamburg.

Specimens used for SEM were dehydrated through a stepwise immersion in ethanol and then dried by critical point drying. The mounted material was coated with a 20 nm Au layer, examined and photographed with a Zeiss EVO LS 15 scanning electron microscope. Digital photographs were enhanced by using Photofiltre 6.5.2 (http://www.photofiltre-studio.com).

3 Systematic account

3.1 *Caenis wui* **n. sp.**
(Figs. 1, 3–6)

Holotype, ♂ larva (on microslide): M22, China, Peking [= Beijing env.], May [exact date missing], leg. C. F. Wu.

Paratypes: same data as holotype, 1♀ larva (differential diagnostic characters are the same in male and female larvae).

Etymology

The new species is dedicated to the collector, Chenfu F. Wu [= Hu Jingfu] (1896–1972).

Male imago

The holotype is a male last instar larva. The following subimaginal features are therefore visible and can be

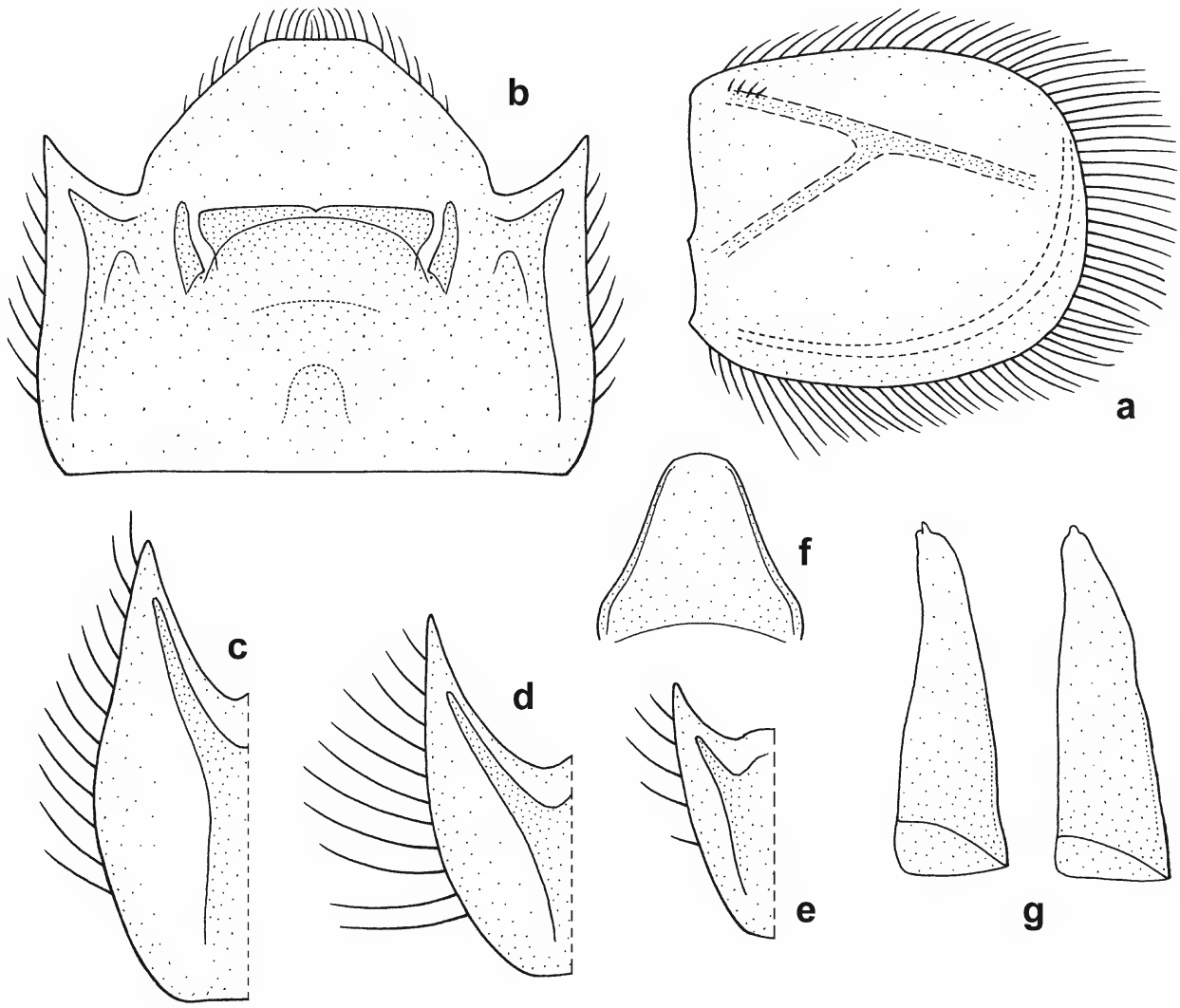


Fig. 1. *Caenis wui* n. sp., larva (a–e) [genitalia of ♂ subimago (b) and lateral processes of subimago (b–e) visible], male subimago (f–g). – **a**. Operculate gill, general view. **b**. Sternum IX. **c**. Abdominal segment VII, lateral part. **d**. Abdominal segment V, lateral part. **e**. Abdominal segment III, lateral part. **f**. Prosternal triangle. **g**. Forcipes.

described: genitalia, arrangement of prosternal ridges, shape of antenna, and posterolateral processes on abdomen:

Base of antennal flagellum not dilated; pedicel more than three times as long as scape. Prosternal ridges forming a triangle with straight or slightly concave lateral sides and broadly rounded tip (Fig. 1f). Abdominal segments V–VIII with long or very long lateral processes (Fig. 1c, d), segments III, IV and IX with shorter ones (Fig. 1b, e). Sternite IX and subimaginal genitalia as in Fig. 1b. Penis anvil-shaped. Forcipes moderately short with converging sides and a sclerotized apical knob or rounded tip (Fig. 1g).

E g g
[extracted from female last instar larva]

Egg oval, relatively short and broad (Fig. 3). Chorion granulated, with two coiled rope-like epithemata of *robusta* subtype. 15–30 threads emerge from the poles (Fig. 4). There are eggs with about 15 threads present on the one and about 30 on the other pole. As all epithemata are already unrolled in the larva, the number of terminal knobs per epithema cannot exactly be determined (12–25). The knobs show apical cap-like structures; from each knob 2–4 threads are leading off (Fig. 5 right) (for

detailed description of coiled rope-like epithema types see MALZACHER 2011: 73, fig. 13). Micropyle with a large oval sperm guide; mouth broadly rounded; visible part of micropyle channel very short (Fig. 5 left).

Larva

Measurements and colouration

Male larva of last instar, body length 5.7 mm, length of cerci 4.5 mm; female larva of last instar, body length 8.0 mm, length of cerci 6.0 mm.

Colouration and pigmentation of the ULMER material is not preserved.

Morphology

Cuticle with small granules (pro and mesonotum) or denticles (operculate gills), two types of bristles: (1) very long and thin, (2) very short, broadly spatulate, more or less frayed. The latter form one or two dense rows laterally and sublaterally on wing buds.

Head: Genae not bulging out. Dorsolateral field of moderate or long bristles on mandibles. Second segment of labial palp 1.2–1.4 times as long as the third (along the centre-line); outer margin with about 6 very long, strong bristles. Sides of postmentum posteriorly slightly diverging, with strong and pointed bristles.

Thorax: Sides of pronotum straight and more or less parallel, anterior corners rounded. Sides of mesonotum with an anterolateral, inconspicuous, flat bulge. Coxal processes narrow, sickle-shaped, not bulging out. Fore femur with a longitudinal row of long thin bristles on dorsal side. Fore tarsus ventrally with a row of strong, dagger-shaped bristles. Mid tarsus with a similar row, additionally with a few apical pinnate bristles. Hind tarsus ventrally with two rows of dagger-shaped bristles, apical part of the inner row with pinnate bristles. Claws with 7–10 strong denticles. All claws relatively small.

Abdomen: Abdominal segments with long posterolateral processes, strongly protruding laterally, particularly in female larvae; margins with long bent bristles, shorter on posterior segments (Fig. 1b–e). Posteriomedian process of tergum II equilateral triangular, with pointed tip; tergum I also with a short and rounded process. Hind margin of tergum VII with long bristles, tergum VIII with only a few bristles (male) or bristles lacking (female), hind margin of terga IX and X with denticles, tergum IX only with a few lateral ones. Hind part of sternum IX triangular, posteriorly broadly rounded or cut, with bristles of moderate length more or less bent medially (Fig. 1b); dorsal side without shagreen. Margins of operculate gills densely provided with long thin bristles (Fig. 1a). Y-shaped ridges well developed, with a few short basal bristles. A ventral band of microtrichia consisting of short transverse rows of about 4 microtrichia (Fig. 6); the band nearly reaching the posteromedian corner of the gill (Fig. 1a). Microtrichia slightly elongated in the posterolateral part of the row (Fig. 6 left). A couple of spatulate, shortly frayed bristles basally on ventral side. Gill II 2.5 times length of gill I. Gills III–V(VI) with long marginal filaments; a great part of them with 5 or 6 branches.

Differential diagnosis

Caenis wui n. sp. can be distinguished from all other *Caenis* species by the following combination of characters:

Male imago: Lateral processes on abdomen long or very long. Penis anvil-shaped. Forcipes moderately short with converging sides and a sclerotized apical knob.

Eggs: with two coiled rope epithemata of *robusta* subtype. About 15–30 threads are anchored on the egg pole. Chorion granulated, without network of ridges. Micropyle channel very short.

Larva: Second segment of labial palp about 1.25 times as long as the third one. Sides of pronotum straight and parallel. Abdominal segments with long posterolateral processes, laterally protruding. Hind part of sternum IX triangular, dorsal side without shagreen. Operculate gill with a ventral band of microtrichia consisting of short transverse rows each with about 4 microtrichia. Most filaments of gills III–V with 5 or 6 branches.

Tab. 1. Differential diagnostic characters of *Caenis wui* n. sp. and *C. robusta*.

Character	*Caenis wui* n. sp.	*Caenis robusta*
Shape of forceps	sides irregular, tip stepped, blunt	triangular with pointed tip
Chorion of egg	with fine granules	with a network of ridges
Labial palp, segment II	1.2–1.4 times length of segment III	0.8–1.0 times length of segment III
Sides of pronotum	straight, parallel, posterior corner rounded	anterior fourth abruptly bent laterally, anterior corner pointed
Operculate gill, band of microtrichia	short transverse rows with about 4 microtrichia	longer transverse rows with 6–8 microtrichia
Hind margin of tergum VIII	without denticles, with a few bristles or without bristles	with denticles and a few bristles
Shagreen on sternum IX	without shagreen	evenly covered with small denticles

Caenis wui is closely related to the Palaearctic species *Caenis robusta* Eaton, 1884 (compare description and figures in MALZACHER 1984 and 1986). Both species share the following characters: Imago: Abdomen with very long lateral filaments. Penis anvil-shaped. Forcipes short, with sides converging to the apex. Eggs with coiled rope-like epithemata of *robusta* subtype (MALZACHER 1982, 2011). – Larva: Third segment of labial palp very long. Fore femur with a longitudinal row of bristles (nearly all other species with a transverse row). Ventral side of operculate gill with a band of microtrichia consisting of short transverse rows; except for *Caenis horaria* (Linnaeus, 1758) all other known larvae of *Caenis* with a single row of microtrichia. The species of the Brachycercinae tribe Caenoculini however possess bands of short transverse rows (MALZACHER, in preparation). For characters distinguishing *Caenis wui* and *C. robusta* see Tab. 1.

ZHOU et al. (2000) described a species with similar genitalia, *Brachycercus parviforcipes*, that was subsequently transferred to the genus *Caenis* (ZHOU & ZHENG 2004). This species also seems to be similar to *Caenis wui*, but the forcipes of the former are short, triangular and pointed, roughly like in *Caenis robusta*. Unfortunately larvae, and hence arrangement of microtrichia on operculate gill and other larval diagnostic features, are unknown.

3.2. *Caenis pekinensis* **n. sp.**
(Figs. 2, 7)

H o l o t y p e , ♂ larva (on microslide): M11, China, Peking [= Beijing env.], [date missing], leg. C. F. WU.

P a r a t y p e s : same data as holotype, 2 ♀♀ larvae (differential diagnostic characters are the same in male and female larvae).

Etymology

The species epithet refers to the locus typicus Peking [= Bejing].

M a l e i m a g o

The holotype is a last instar male larva. Therefore a few subimaginal characters can be described:

Base of antennal flagellum not dilated. Abdomen with short posterolateral processes (Fig. 2c). Sternite IX and

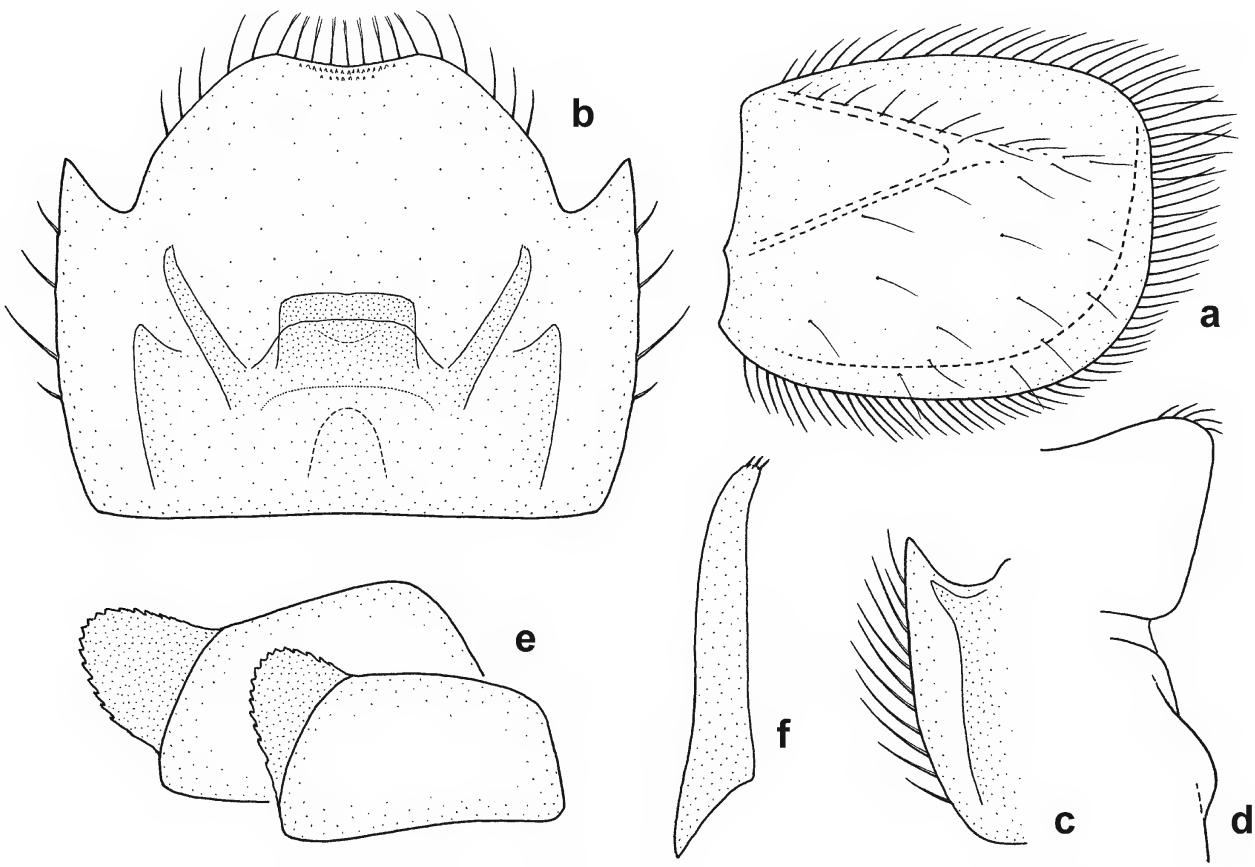
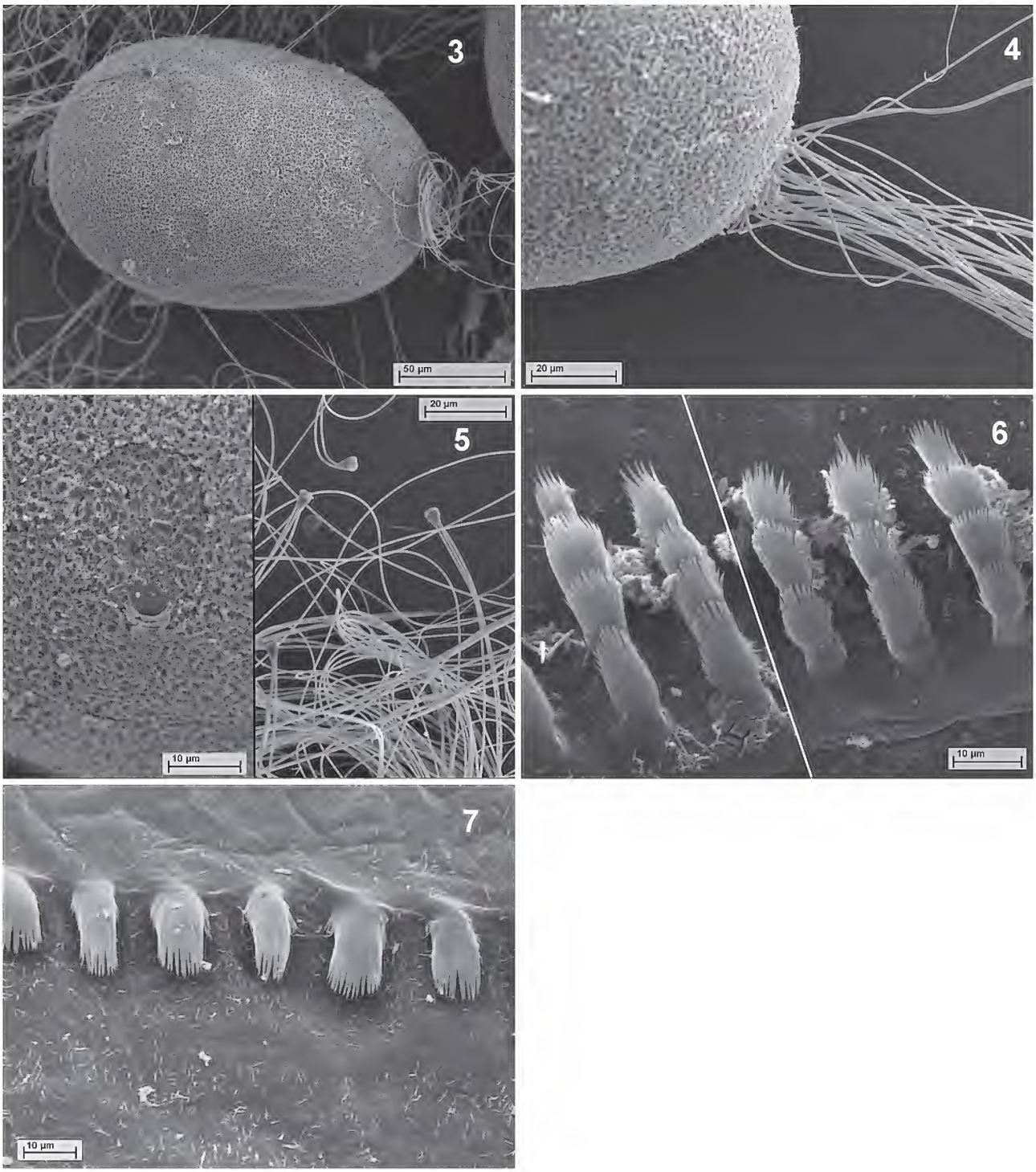


Fig. 2. *Caenis pekinensis* n. sp., larva (a–e) [genitalia of ♂ subimago (b) and lateral processes of subimago (c) visible], male subimago (f). – **a**. Operculate gill, general view. **b**. Sternum IX. **c**. Abdominal segment VII, lateral part. **d**. Lateral outline of pronotum and anterior part of mesonotum. **e**. Coxal processes of mid (right) and hind leg (left). **f**. Forceps.



Figs. 3–7. *Caenis wui* n. sp. (3–6) [eggs dissected from ♀ last instar larva], C. *pekinensis* n. sp. (7). – **3**. Egg. **4**. Egg, polar region, with tuft of threads. **5**. Egg, threads with terminal knobs (right), micropyle (left). **6**. Larva, operculate gill, microtrichia from the band on ventral side, from anterolateral (right) and posterolateral (left) regions. **7**. Larva, operculate gill, microtrichia from the band on ventral side.

subimaginal genitalia as in Fig. 2b. Penis square, no lateral lobes. Forcipes long and straight, median part with nearly parallel sides; apex with a few short spines (Fig. 2f).

Larva

Measurements and colouration

Male larva of last instar, body length 3.5 mm, length of cerci 2.5 mm; female larva of last instar, body length 6.0 mm, length of cerci 3.5 mm.

Colouration and pigmentation of the ULMER material is not preserved.

Morphology

Cuticle smooth or with very small, inconspicuous denticles.

Head: Genae bulging out. Dorsolateral field of long bristles on mandibles. Second segment of labial palp 2.2–2.5 times as long as the third (along the centre-line); outer margin with about 9 long, strong bristles.

Thorax: Sides of pronotum straight, more or less diverging anteriorly, anterior corners rounded; sides of mesonotum anterolaterally with a flat, broadly rounded process (Fig. 2d). Coxal processes well developed, semicircular or tongue-shaped, margin denticulated (Fig. 2e). Fore femur dorsally with a transverse row of thin bristles of different length and a posteriorly adjoining group of bristles. Mid and hind femora with long bristles on margins and dorsal surface. Tibiae with a submarginal row of long bristles and spines on anterior margin; posterior margin with bristles shorter than those on femora. Fore tarsus ventrally with a row of short pointed bristles, apical ones more or less pinnate. Mid tarsus with a similar row, additionally with a few apical pinnate bristles. Hind tarsus ventrally with one long and one short row (short one half the length of long one) or an irregular band of short, pointed bristles with apical ones pinnate. Claws slightly bowed, with minute denticles, often hardly visible.

Abdomen: Abdominal segments with moderate posterolateral processes, more or less protruding laterally; margins with long bent bristles, shorter on posterior segments (Fig. 2b, c). Posteriomedian process of tergum II flat and broadly rounded, semicircular. Hind margin of terga VII and VIII with long bristles, of terga IX and X with denticles. Hind margin of sternum IX with a flat indentation or cut, with bristles of moderate length more or less bent medially, the median ones apically bifurcated; dorsal side with one or two rows of microdenticles close to the hind margin (in the female larva immediately on hind margin and hardly visible) (Fig. 2b). Margins of operculate gills densely provided with thin bristles of moderate length; surface with scattered thin bristles; posterior part of median ridge reduced, only indicated by a row of thin bristles (Fig. 2a). Outer ridge consisting of strong, rounded denticles. Ventral row of short microtrichia (Fig. 7) running to the posteriomedian corner of the gill (Fig. 2a). Basal part with more or less frayed, spatulate bristles of different length and shape. Gill II 2.5 times length of gill I.

Differential diagnosis

Caenis pekinensis n. sp. can be distinguished from all other *Caenis* species by the following combination of characters:

Male imago: Penis square. Forcipes long and straight, nearly parallel-sided, with a few short apical spines.

Larva: Second segment of labial palp 2.2–2.5 times length of third segment. Sides of pronotum diverging anteriorly. Coxal processes well developed. Posteromedian process on abdominal tergum II broad, semicircular. Hind margin of sternum IX with a flat indentation or cut. Y-shaped ridge on operculate gill posteriorly reduced, outer ridge consisting of strong rounded denticles.

As a Palaearctic species, *Caenis pekinensis* seems to belong to the *Caenis beskidensis*-group. The larva of *Caenis pycnacantha* from eastern China, described by JIA et al. 2010, is similar to that of *C. pekinensis*, but *C. pycnacantha* differs by sides of pronotum clearly convex, claws with 6–10 well developed denticles, and posterior part of Y-shaped ridge well developed. Males of *C. pycnacantha* show a dilated base of antennal flagellum, penis with broadly rounded lobes, bowed forceps with converging sides and strong apical spines.

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New tachyine species from the Oriental Region (Coleoptera: Carabidae: Bembidiini: Tachyina)

Martin Baehr

Abstract

Eight new species of the bembidiine subtribe Tachyina are described from various countries in the Oriental Region: genus *Elaphropus* Motschulsky, 1839, subgenus *Tachyura* Motschulsky, 1862: *E. serrulipennis* **n. sp.** and *E. schawalleri* **n. sp.** from the island of Leyte/Philippines, *E. rufinus* **n. sp.** from Brunei/Borneo, *E. grimmi* **n. sp.** from Sabah/Borneo, and *E. martensi* **n. sp.** from Nepal; genus *Tachyta* Kirby, 1837: *T. quadrinotata* **n. sp.** from Nepal and *T. laticollis* **n. sp.** from Sabah/Borneo; genus *Paratachys* Casey, 1918: *P. leytensis* **n. sp.** from the island of Leyte/Philippines. For *T. laticollis* n. sp. a **new subgenus** *Eurytachyta* within the genus *Tachyta* is described. Male and female genitalia are figured if available. The new species are compared with their most similar relatives.

Keywords: Coleoptera, Carabidae, Bembidiini, Tachyina, new species, Oriental Region.

Zusammenfassung

Acht neue Arten der Subtribus Tachyina der Tribus Bembidiini aus verschiedenen Ländern der Orientalischen Region werden beschrieben: Gattung *Elaphropus* Motschulsky, 1839, Untergattung *Tachyura* Motschulsky, 1862: *E. serrulipennis* **n. sp.** und *E. schawalleri* **n. sp.** von der Philippineninsel Leyte, *E. rufinus* **n. sp.** aus Brunei/Borneo, *E. grimmi* **n. sp.** aus Sabah/Borneo und *E. martensi* **n. sp.** aus Nepal; Gattung *Tachyta* Kirby, 1837: *T. quadrinotata* **n. sp.** aus Nepal und *T. laticollis* **n. sp.** aus Sabah/Borneo; Gattung *Paratachys* Casey, 1918: *P. leytensis* **n. sp.** von Leyte. Für *Tachyta laticollis* n. sp. wird eine **neue Untergattung** *Eurytachyta* innerhalb der Gattung *Tachyta* beschrieben. Die männlichen und weiblichen Sexualorgane werden abgebildet, sofern bekannt. Die neuen Arten werden mit ähnlichen bzw. verwandten Arten verglichen.

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1 Introduction

Through courtesy of several collectors and museum curators a number of tachyine species from the Oriental Region have been received recently for identification that include some undescribed species alongside with several more or less well known species. The new species belong to the genera *Elaphropus* Motschulsky, 1839, subgenus *Tachyura* Motschulsky, 1862, *Tachyta* Kirby, 1837, and *Paratachys* Casey, 1918, and are described herein.

The supraspecific taxonomy of the subtribe (or tribe) Tachyina (-ini) is still being discussed and several opinions exist about the status of most supraspecific groups. In this paper I mainly follow the system of Lorenz (2005) who, apart from a number of well defined genera, for the bulk of species acknowledged two genera, namely *Tachys* Dejean, 1821 and *Elaphropus* Motschulsky, 1839. *Tachyura* Motschulsky, 1862 belongs as subgenus to *Elaphropus*.

The subgenus *Tachyura* as denoted by Lorenz (2005) (including the Nearctic species of the former genus *Barytachys* Chaudoir, 1868) covers more than 250 species that are distributed in the Palaearctic, Afrotropical, Oriental, Papuan/Australian, and Nearctic Regions. The subgenus, or at least the eastern species, excluding the Nearctic *Barytachys*, is equivalent to the *politus*-group and some related species-groups of Andrewes (1925) and Darlington (1962). It should be mentioned, however, that the generic and subgeneric systematics of Tachyini are by no means settled. Sciaky & Vigna Taglianti (2003) and Kopecký (2003), for example, proposed different systems with more restricted limits of the subgenus *Tachyura*. Also the status of the genus or subgenus *Nototachys* Alluaud, 1930 is controversely discussed.

The species of *Tachyura* in the sense of Lorenz (2005) are characterized by absence of deep pits on the mentum, parallel frontal sulci which do not completely cross over

onto the clypeus, presence of the 8th elytral stria which usually is deeply impressed and almost complete, the apical recurrent striole being situated more or less in the middle of the elytra, edentate humerus, and the pronotum with an impressed basal sulcus.

This subgenus includes very differently shaped, structured, and coloured species. The Oriental region is particularly rich in species and certainly the Oriental *Tachyura* fauna would merit a modern comprehensive revision, in spite of the large paper of Andrewes (1925) which still must be used for identification of species. However, this is presently outside of the capacity of the author. Also probably many additional species are supposed to exist in the Oriental Region which has not been sufficiently and systematically collected for tachyine beetles. The New Guinean species of *Tachyura* were revised by Darlington (1962), but this revision likewise is rather preliminary. The Australian species were revised by Baehr (1988). A number of additional species, mainly from the southern Oriental Region and from New Guinea, were recently described by Baehr (2014a).

Kopecký (2003) and Lorenz (2005) included *Paratachys* Casey, 1918 as a subgenus in the genus *Tachys* Dejean, 1821 (s. l.). In this decision I do not follow them in the present paper, but, like most other modern authors, treat *Paratachys* as a separate genus. It is a very large genus which includes a multitude of species throughout the world, and it is congruent with the *triangularis*-group of Andrewes (1925).

Species of *Paratachys* are characterized by the presence of two deep pits in the mentum and a distinct recurrent stria on the elytra that runs in the middle of the apex and embraces the posterior discal puncture just at its incurved apex.

The genus *Tachyta* Kirby, 1837 includes a number of more or less depressed species which are distributed in the Holarctic, Afrotropical, Oriental, and Australian Regions. It is characterized by finely serrulate tarsal claws, elongate terminal palpomeres, and a straight, elongate recurrent stria that runs close to the elytral margin. The genus includes three subgenera, two of which occur in the Oriental Region.

Eight new species from the genera *Elaphropus*, *Tachyta*, and *Paratachys* are herein described from Nepal, Borneo, and the Philippines. In the genus *Tachyta* a new subgenus *Eurytachyta* is described for an unusual new species.

Acknowledgements

I am indebted to Roland Grimm (Neuenbürg), Wolfgang Schawaller (Stuttgart), and David Wrase (Berlin) for the kind loan or gift of specimens. I also thank Charles Huber (Bern) and Joachim Schmidt (Admannshagen) for some corrections.

2 Material and methods

For the taxonomic treatment standard methods were used. The genitalia were removed from specimens relaxed for a night in a jar under moist atmosphere, then cleaned for a short while in hot 4 % KOH.

The habitus photographs were obtained with a digital camera using ProgRes Capture Basic and AutoMontage and subsequently were worked with Corel Photo Paint X14.

Measurements were taken using a stereo microscope with an ocular micrometer. Body length has been measured from apex of labrum to apex of elytra. Length of pronotum was measured along midline, width of base of pronotum at the extreme tips of the basal angles.

The types are stored in the working collection M. Baehr in Zoologische Staatssammlung, München (CBM), in Staatliches Museum für Naturkunde, Stuttgart (SMNS), and in the collection D. Wrase, Berlin (CWB).

3 Genus *Elaphropus*, subgenus *Tachyura* Motschulsky, 1862

Tachyura Motschulsky, 1862: 27. – Andrewes 1925: 328; Csiki 1928: 166; Baehr 1988: 229, 2014a: 2; Sciaky & Vigna Taglianti 2003: 93; Kopecký 2003: 278; Lorenz 2005: 208.

Type species: *Elaphrus quadrisignatus* Duftschmid, 1812, by subsequent designation by Motschulsky (1862).

Diagnosis

The subgenus is characterized by absence of deep mental pits, well developed posterior transverse sulcus of the pronotum, almost complete 8th elytral stria, rounded humerus, well developed recurrent stria on the elytra that is situated more or less in the middle, and presence of two discal elytral punctures and setae.

Description of *Elaphropus serrulipennis* n. sp. (Figs. 1, 6, 12)

Holotype (♂): "Philippines, Leyte, visca N Baybay, cultiv. land, 1991, leg. Schawaller & al. / 4.III.1991" (SMNS).

Paratypes (3♂♂, 8♀♀): same locality, but 28.II.1991, 1.III.1991, 4.III.1991, 8.III.1991 (CBM, SMNS).

Etymology

The species name refers to the strongly serrate lateral margins of the elytra.

Diagnosis

Characterized by pale reddish-brown colour, depressed eye, cordiform pronotum with rectangular basal angle, markedly serrate margin of the elytra, presence of the complete set of elytral striae, uninterrupted 8th elytral stria, straight, and oblique recurrent stria that is rather closely situated to the lateral margin.

In some character states this species reminds *E. singularis* (Andrewes, 1925) of the *exaratus*-group of Andrewes (1925) or the *singularis*-group in the sense of Darlington (1962), but is distinguished by the completely striate elytra

which are serrulate and setulose almost along their whole length, and by the uninterrupted 8th stria.. Because it does not match the most important determining character states of both groups, I prefer to include it into the subgenus *Tachyura* without attributing to a definitive subgroup.

Description

Measurements and ratios. Body length: 2.10–2.25 mm; width: 0.85–0.90 mm. Ratios: Width/length of pronotum: 1.42–1.47; widest diameter/width of base of pronotum: 1.23–1.28; width of pronotum/width of head: 1.31–1.35; length/width of elytra: 1.51–1.57.

Colour (Fig. 12). Upper and lower surfaces unicolourous pale reddish-brown. Antenna, palpi, and legs yellow.

Head (Fig. 12). Of normal size but eye depressed and little produced laterad, orbit small and indistinct. Labrum anteriorly straight. Clypeus straight, clypeal suture shallow. Frons slightly convex, without any impression. Frontal furrows wide and shallow, slightly curved, anteriorly not crossing onto clypeus, posteriorly attaining middle of eye. Mandible rather elongate, palpi thick, pubescent, apical palpomere short and very thin. Mentum without pores. Antenna fairly elongate, 7th–10th antennomeres twice as long as wide. Dorsal surface impunctate, with distinct though superficial, about isodiametric microreticulation that consists of rather large meshes, surface glossy,

Pronotum (Fig. 12). Moderately wide, cordiform, at base about as wide as at apex; dorsal surface gently convex. Apex with deep excision, apical angles markedly projected and rather acute. Lateral border evenly convex but in basal quarter straight or very slightly concave. Base laterally slightly excised, in middle produced, basal angles rectangular, acute. Lateral sulcus very narrow, not widened at base. Both, apex and base not margined. Median line fine, slightly impressed, not attaining the apex, near base deepened to a wide sulcus. Anterior transverse impression barely perceptible, posterior impression deep, finely crenulate, in the median sulcus with a pore. Basal grooves absent, base near lateral margin without a carina. Anterior lateral seta inserted at anterior third, in front of widest diameter, posterior lateral seta inserted near basal angle. Surface impunctate, with extremely superficial, about isodiametric microreticulation, very glossy.

Elytra (Fig. 12). Moderately elongate, lateral margin slightly convex, elytra wide at humerus; dorsal surface moderately convex but depressed on disk. Humerus rounded, not produced, basal margin incomplete, attaining c. level of 4th stria. The complete lateral margin serrulate, more coarsely so in basal third, but not setulose. All striae distinct, deeply impressed, at bottom very finely crenulate. Striae almost attaining base, except the sutural one ending in front of apex, the outer ones more shortened than the inner ones, apex widely glabrous. All intervals on disk markedly raised, even slightly tectiform. 8th stria complete, uninterrupted, deeply impressed, impunctate. Recurrent stria deep, moderately elongate, oblique, straight, at end not incurved, situated rather close to margin. 3rd interval bipunctate, the anterior puncture located at basal third, the posterior puncture located about at apical third, both adjacent to 3rd stria. Intervals impunctate, with distinct, though superficial, about isodiametric microreticulation, surface glossy.

Lower surface. Not pilose, glabrous. Metepisternum slightly > 1.5 times as long as wide at apex. Terminal abdominal sternum in male bisetose, in female quadrisetose.

Legs. Two basal tarsomeres of the male protarsus slightly widened, squamose underneath, and mediad triangularly dentate.

Male genitalia (Fig. 1). Aedeagus short and compact, stout in apical part, lower surface evenly concave. Apex short and stout, rounded; internal sac with several slightly twisted folds, one of which is rather heavily sclerotized. Parameres very dissimilar, the left one very large, triangular and slightly curved down, the right one smaller but comparatively wide, both with two elongate and one shorter apical setae.

Female gonocoxites (Fig. 6). Gonocoxite 1 comparatively large, without any setae. Gonocoxite 2 short and wide, slightly triangular, straight, only near apex slightly incurved, with wide, obtuse apex. Two short but stout ventro-lateral ensiform setae situated in apical half, one short and stout dorso-median ensiform seta situated close to apex; one short subapical nematiform seta near apex originating from a circular pit.

Variation. Very little variation noted.

Distribution

Island of Leyte, Philippines. Known only from type locality.

Collecting circumstances

According to information of the collector, sampled at light.

Relationships

Uncertain. The species combines character states of different species groups, respectively subgenera, therefore its status remains uncertain as long as a comprehensive phylogenetic survey of the whole tachyine lineage is lacking.

Description of *Elaphropus schawalleri* **n. sp.**
(Figs. 2, 7, 13)

Holotype (♂): "Philippines, Leyte, SW Abuyog, 28.II.1991, river bank, leg. SCHAWALLER & al." (SMNS).

Paratypes (4♂♂, 4♀♀): same data (CBM, SMNS).

Etymology

The species name is a patronym in honour of the collector WOLFGANG SCHAWALLER of Staatliches Museum für Naturkunde, Stuttgart.

Diagnosis

Characterized by presence of three elytral striae, unimaculate elytra, cordiform pronotum, and dark antenna. Very similar to *E. borneensis* (Andrewes, 1925), but distinguished by lesser number of elytral striae, narrower base of the pronotum, shorter elytra, and darker antenna, palpi, and legs.

Description

Measurements and ratios. Body length: 2.50–2.75 mm; width: 1.1–1.2 mm. Ratios: Width/length of pronotum: 1.35–1.42; widest diameter/width of base of pronotum: 1.26–1.28; width of pronotum/width of head: 1.30–1.33; length/width of elytra: 1.41–1.46.

Colour (Fig. 13). Black, elytra near apex with an ill delimited, rather inconspicuous, yellow or pale red spot that extends between 3rd or 4th and 7th intervals. Antenna dark with 1st and basal part of 2nd antennomere pale, basal and apical palpomeres of maxillary palpus dirty yellow, penultimate palpomere dark; legs dirty yellow to pale brown.

Head (Fig. 13). Of average size. Eye large, laterad rather produced, orbit short, oblique-convex. Labrum anteriorly straight. Clypeus straight, clypeal suture inconspicuous or even not perceptible. Frons slightly convex, without any impression. Frontal furrows slightly duplicated, deep, short, straight, anteriorly slightly crossing to the clypeus, posteriorly not turned laterad. Sulcus medially of the eye deep. Mandible, palpi and the lower surface of the head as in similar species of the subgenus. Antenna moderately short, 7th–10th antennomeres slightly less than twice as long as wide. Dorsal surface impunctate, with distinct though slightly superficial, about isodiametric microreticulation, fairly glossy.

Pronotum (Fig. 13). Moderately wide, at base barely wider than at apex; dorsal surface gently convex. Apex almost straight, apical angles not projected and widely rounded. Lateral border convex over most of its length, near base shortly concave. Base laterally straight to faintly oblique, in middle slightly produced, basal angles rectangular, acute. Lateral sulcus moderately narrow, not widened basad. Apex laterally finely margined, base not margined except near basal angles. Median line fine, slightly deepened basad, neither attaining apex nor base. Anterior transverse impression barely perceptible, posterior impression deep, distinctly crenulate, in middle with a small, barely perceptible puncture. Basal grooves moderately deep, base near lateral margin with a short, slightly oblique, sharp carina. Anterior lateral seta inserted slightly in front of middle, about at widest diameter, posterior lateral seta inserted at basal angle. Surface impunctate, with indistinct, very superficial, isodiametric to slightly transverse microreticulation that in some areas is almost invisible; surface glossy, except for the rather rugose base.

Elytra (Fig. 13). Moderately elongate, not oviform, lateral margin in middle almost straight, wide at humerus; dorsal surface moderately convex but depressed on disk. Humerus rounded, basal margin incomplete, attaining c. level of 4th stria. Three deeply impressed, not crenulate striae present. 1st stria attaining scutellary puncture and apex, 2nd and 3rd striae at base shortened, and gradually ending far in front of apex, apex widely glabrous. In some specimens in middle faint traces of a 4th and even a 5th stria perceptible. Intervals on disk slightly raised. 8th stria complete, deeply impressed, impunctate. Recurrent stria deep, elongate, straight, at end not incurved. 3rd interval bipunctate, the anterior puncture located about at basal third, the posterior puncture located slightly in front of the apical third, both adjacent to 3rd stria. Surface impunctate, at least laterally with traces of very superficial, about isodiametric microreticulation, surface glossy.

Lower surface. Not pilose, glabrous. Metepisternum c. 1.75 times as long as wide at apex. Terminal abdominal sternum in male bisetose, in female quadrisetose.

Legs. Two basal tarsomeres of the male protarsus slightly widened, squamose underneath, and mediad triangularly dentate.

Male genitalia (Fig. 2). Aedeagus rather elongate, stout in middle, triangularly narrowed towards apex, lower surface evenly concave. Apex rather elongate, obtusely rounded; internal sac with several slightly twisted folds, one of which, situated at bottom, is heavily sclerotized. Parameres very dissimilar, the left one very large, triangular, with two elongate apical setae, the right one smaller but comparatively wide, with a single elongate apical seta.

Female gonocoxites (Fig. 7). Gonocoxite 1 comparatively large and elongate, triangular, without any setae. Gonocoxite 2 elongate, triangular, curved, with rather acute apex. Two very small ventro-lateral ensiform setae situated about in middle, moderately separated, the dorsomedian ensiform seta absent; one short subapical nematiform seta present near apex and originating from a circular pit.

Variation. Very little variation noted.

Distribution

Island of Leyte, Philippines. Known only from type locality.

Collecting circumstances

Sampled at "river bank", but unknown whether by hand collecting or whether at light.

Relationships

In body shape, structure of elytra, and aedeagus very similar, and probably closely related to *E. borneensis* (Andrewes, 1925).

Description of *Elaphropus rufinus* **n. sp.**
(Figs. 3, 14)

Holotype (♂): "Borneo, Brunei, Temburong Kuala Belalong, BORCHERDING leg. / 10.II.1995 HW KBFSC" (CWB).

Paratype (♂): same data (CBM).

Etymology

The name refers to the dark rufous colour of this species.

Diagnosis

Characterized by rufous colour, cordiform pronotum with trifoveate basis, presence of four short, coarsely crenulate elytral striae, inconspicuously quadrimaculate elytra, and absolutely glabrous surface. Distinguished from similarly short and compact species [e. g. *E. latus* (Peyron, 1858) or *E. aeneus* (Putzeys, 1875)] by colour and number, size, and structure of the elytral striae.

Description

Measurements and ratios. Body length: 2.55–2.70 mm; width: 1.25–1.30 mm. Ratios: Width/length of pronotum: 1.27–1.30; widest diameter/width of base of pronotum: 1.27–1.28; width of pronotum/width of head: 1.26–1.27; length/width of elytra: 1.35–1.37.

Colour (Fig. 14). Upper and lower surfaces dark red, elytra with four moderately distinct pale red spots. The humeral spot more ill delimited and extended from 4th or 5th interval to margin, the apical spot more distinct, extended from 3rd to 7th intervals, and well removed from apex that is slightly paler than the disk. 1st–3rd antennomeres and basal half of 4th yellow, rest infuscate. Palpi and legs yellow.

Head (Fig. 14). Of average size. Eye very large, laterad well produced, orbit very small. Labrum anteriorly slightly excised. Clypeus straight, clypeal suture rather deep. Frons slightly convex, without any impression. Frontal furrows duplicated, deep, almost straight, anteriorly slightly crossing to the clypeus, posteriorly slightly turned laterad. Sulcus medially of the eye deep. Mandible, palpi and the lower surface of the head as in similar species of the subgenus. Antenna moderately elongate, 7th–10th antennomeres c. 1.75 times as long as wide. Dorsal surface impunctate and without microreticulation, very glossy, only labrum with superficial, isodiametric microreticulation.

Pronotum (Fig. 14). Rather wide, at base slightly wider than at apex; dorsal surface rather convex. Apex straight, apical angles not projected, very widely rounded. Lateral border convex, in basal third rather deeply concave. Base laterally straight, in middle produced, basal angles slightly less than rectangular, acute. Lateral sulcus narrow, not widened basad. Apex laterally finely margined, base not margined except near basal angles. Median line very fine, inconspicuous, neither attaining apex nor base. Anterior transverse impression not perceptible, posterior impression deep, very finely crenulate, in middle with three large and deep pores. Basal grooves very deep, base near lateral margin with a short, slightly oblique, sharp carina. Anterior lateral seta inserted slightly in front of middle, at widest diameter, posterior lateral seta inserted at basal angle. Surface very glossy, impunctate and without microreticulation.

Elytra (Fig. 14). Wide and short, not oviform, lateral margin in middle straight, wide at humerus; dorsal surface convex but depressed on disk. Humerus faintly angulate, basal margin incomplete, attaining c. level of 4th stria. Four striae present, deeply impressed, and coarsely crenulate. 1st stria attaining scutellary puncture and apex, 2nd–4th striae gradually shortened at base and apex, apex widely glabrous. All intervals on disk raised. 8th stria complete, deeply impressed, impunctate. Recurrent stria fairly deep, short, oblique, at end incurved. 3rd interval bipunctate, the anterior puncture located at basal third, the posterior puncture located slightly in front of the apical third, both adjacent to 3rd stria. Intervals impunctate and without microreticulation, surface very glossy.

Lower surface. Not pilose, glabrous. Metepisternum slightly < 1.5 times as long as wide at apex. Terminal abdominal sternum in male bisetose.

Legs. Two basal tarsomeres of the male protarsus slightly widened, squamose underneath, and mediad triangularly dentate.

Male genitalia (Fig. 3). Aedeagus moderately elongate, stout in middle, triangularly narrowed towards apex, lower surface straight. Apex rather short, fairly stout, obtusely rounded; internal sac with several slightly twisted folds, one of which is heavily sclerotized. Parameres very dissimilar, the left one very large, triangular, the right one smaller but comparatively wide, both with three elongate apical setae.

Female gonocoxites. Unknown.

Variation. Very little variation noted.

Distribution

Brunei, Borneo. Known only from type locality.

Collecting circumstances

Not recorded.

Relationships

A rather unique species, apparently without close relatives.

Description of *Elaphropus martensi* **n. sp.** (Figs. 4, 8, 15)

Holotype (♂): "320 Ilam Distr. betw. Mai Pokhari and Gitang Khola Valley, 2100–1750 m, tree rich cultural land, 11 Apr 1988, J. Martens & W. Schawaller leg. / Nepal-Expeditionen Jochen Martens" (SMNS).

Paratype (♀): "321 Ilam Distr., Gitang Khola Valley, *Alnus* forest along river, 1750 m, 11–13 Apr 1988, J. Martens & W. Schawaller leg. / Nepal-Expeditionen Jochen Martens" (CBM).

Etymology

The name is a patronym in honour of the collector Jochen Martens, well known explorer of the fauna of Nepal.

Diagnosis

Characterized by black colour, cordiform pronotum with unifoveate basis, presence of only one distinctly impressed elytral stria, quadrimaculate elytra, and absolutely glabrous surface. Distinguished from the most similar species *E. stevensi* (Andrewes, 1925) by absence of the 2nd stria and distinctly crenulate base of the pronotum.

Description

Measurements and ratios. Body length: 2.85–2.90 mm; width: 1.25 mm. Ratios: Width/length of pronotum: 1.33–1.34; widest diameter/width of base of pronotum: 1.36–1.40; width of pronotum/width of head: 1.36–1.39; length/width of elytra: 1.44–1.45.

Colour (Fig. 15). Upper and lower surfaces black, elytra with four moderately distinct pale red spots. The humeral spot slightly triangular and extended from site of 4th interval to margin, the apical spot transverse, extended from 3rd interval to margin and well removed from apex that is slightly paler than the disk. Antenna, palpi, and legs yellow.

Head (Fig. 15). Of average size. Eye fairly large, laterad moderately produced, orbit comparatively elongate, c. ⅓ of eye length, oblique-convex. Labrum almost straight. Clypeus straight, clypeal suture distinct. Frons slightly convex, without any impression. Frontal furrows duplicated, short, deep, anteriorly slightly crossing to the clypeus, posteriorly turned laterad. Sulcus medially of the eye deep. Mandible, palpi and the lower surface of the head as in similar species of the subgenus. Antenna moderately elongate, 7th–10th antennomeres slightly < 1.75 times as long as wide. Dorsal surface impunctate and without microreticulation, very glossy, only labrum with superficial, isodiametric microreticulation.

Pronotum (Fig. 15). Wide, at base slightly wider than at apex; dorsal surface rather convex. Apex straight, apical angles not projected, very widely rounded. Lateral border convex, in basal fourth more or less deeply concave. Base laterally straight, in middle produced, basal angles slightly less than rectangular, acute, laterad even slightly projected. Lateral sulcus narrow, slightly widened in middle, narrowed basad. Apex laterally finely margined, base not margined except near basal angles. Median line fine, slightly deepened, neither attaining apex nor base. Anterior transverse impression not perceptible, posterior impression deep, distinctly crenulate, in middle with a large and deep pore. Basal grooves very deep, base near lateral margin with a short, slightly oblique, sharp carina. Anterior lateral seta inserted slightly in front of middle, slightly in front of widest diameter, posterior lateral seta inserted at basal angle. Surface very glossy, impunctate and without microreticulation.

Elytra (Fig. 15). Moderately elongate, not oviform, lateral margin in middle almost straight, wide at humerus; dorsal surface convex but depressed on disk. Humerus not angulate, obliquely rounded, basal margin incomplete, attaining c. level of 4th stria. Sutural stria distinct and complete, deeply impressed, not or very weakly crenulate; traces of 2nd stria in middle more or less distinct, but barely impressed. 8th stria complete, deeply impressed, impunctate. Recurrent stria fairly deep, short, oblique, at end slightly incurved. 3rd interval bipunctate, the anterior puncture located at basal third, the posterior puncture located slightly behind middle, both adjacent to position of 3rd stria. Surface impunctate and without microreticulation, very glossy.

Lower surface. Not pilose, glabrous. Metepisternum c. 1.5 times as long as wide at apex. Terminal abdominal sternum in male bisetose, in female quadrisetose.

Legs. Two basal tarsomeres of the male protarsus slightly widened, squamose underneath, and mediad triangularly dentate.

Male genitalia (Fig. 4). Aedeagus rather elongate, moderately stout in middle, triangularly narrowed towards apex, lower surface in middle slightly convex, but apical fourth markedly curved down. Apex very stout but rather elongate, obtusely rounded; internal sac with several slightly twisted folds, one of which is heavily sclerotized. Parameres very dissimilar, the left one very large, triangular, the right one smaller and narrow, both with a single elongate apical seta.

Female gonocoxites (Fig. 8). Gonocoxite 1 large, triangular, without any setae. Gonocoxite 2 fairly elongate, triangular, slightly curved, with rather acute apex. Two very small ventro-lateral ensiform setae situated about in middle, moderately separated, the dorso-median ensiform seta absent; one short subapical nematiform seta present near apex and originating from a circular pit.

Variation. Little variation noted in depth of sinuosity of the lateral margin of the pronotum and in distinctness of 2nd stria.

Distribution

Nepal. Known only from the Singalila mountain range of the easternmost Nepal Himalaya close to the border to the Darjeeling District of India.

Collecting circumstances

Both specimens collected in forested area in river valley, but unknown whether by hand collecting or whether at light.

Relationships

In body shape and structure of elytra most similar and probably closely related to *E. stevensi* (Andrewes, 1925).

Description of *Elaphropus grimmi* **n. sp.**
(Figs. 5, 16)

Holotype (♂): "Borneo, Malaysia, Sabah NE, Keningau, Bingkor, 380 m, 22.III.2013, R. Grimm" (CBM).

Etymology

The species name is a patronym in honour of the collector Roland Grimm, well known authority of Oriental Tenebrionidae.

Diagnosis

Characterized by unicolourous glossy black colour and hirsute elytra. Distinguished from the likewise hirsute *E. barringtoni* (Andrewes, 1925), *E. interpunctatus* (Putzeys, 1875), and *E. hirsutus* Baehr, 2014, by different number of elytral striae, in addition from *E. interpunctatus* by absence of the elytral spot, from *E. barringtoni* by the elytral striae almost attaining the base of the elytra, and from *E. hirsutus* by not deeply excised base of the pronotum.

Description

Measurements and ratios. Body length: 2.6 mm; width: 1.1 mm. Ratios: Width/length of pronotum: 1.32; widest diameter/width of base of pronotum: 1.34; width of pronotum/width of head: 1.38; length/width of elytra: 1.47.

Colour (Fig. 16). Upper and lower surfaces unicolourous glossy black, elytra unspotted. Antenna dark except 1st and basal half of 2nd antennomere. Palpi yellow, but the penultimate palpomeres piceous. Legs bright yellow.

Head (Fig. 16). Of average size. Eye large, laterad well produced, orbit very small. Labrum anteriorly straight. Clypeus straight, clypeal suture shallow. Frons slightly convex, without any impression. Frontal furrows not perceptibly duplicated, deep, slightly oblique, anteriorly slightly crossing to the clypeus, posteriorly slightly turned laterad. Sulcus medially of the eye deep. Mandible, palpi and the lower surface of the head as in similar species of the subgenus. Antenna moderately short, 7th–10th antennomeres slightly < 1.5 times as long as wide. Dorsal surface impunctate and without microreticulation, very glossy, only labrum with superficial, isodiametric microreticulation.

Pronotum (Fig. 16). Moderately wide, at base barely wider than at apex, dorsal surface very convex. Apex straight, apical angles not projected and widely rounded. Lateral border very convex, in basal fourth slightly concave. Base slightly convex, laterally slightly oblique, basal angles slightly more than rectangular, acute. Lateral sulcus very narrow, basad not widened. Apex laterally finely margined, base not margined except near basal angles. Median line very fine, inconspicuous, barely impressed, neither attaining apex nor base. Anterior transverse impression barely perceptible, posterior impression deep, little curved, distinctly crenulate, in middle with a very small, barely discernible puncture. Basal grooves deep, base near lateral margin with a very short, slightly oblique, sharp carina. Anterior lateral seta inserted about in middle, at widest diameter, posterior lateral seta inserted at basal angle. Surface very glossy, impunctate and without microreticulation.

Elytra (Fig. 16). Fairly elongate, not oviform but somewhat oblong-triangular, widest at humerus, lateral margin in middle straight and very slightly oblique; dorsal surface convex but depressed on disk. Humerus oblique and rounded, basal margin incomplete, attaining c. level of 3rd stria. Five striae present, deeply impressed, smooth. All striae, including 1st, at base slightly shortened, the inner ones slightly more than 5th stria. All striae except the sutural one ending far in front of apex, the outer ones more shortened than the inner ones, apex widely glabrous. All intervals on disk markedly convex. 8th stria complete, deeply impressed, impunctate. Recurrent stria short, deep, oblique, at end not incurved. Intervals with a row of elongate, erect setae which is much denser on the even intervals, surface therefore remarkably hirsute. Punctures on 3rd interval not discernible. Surface without microreticulation, very glossy.

Lower surface. Not pilose, glabrous. Metepisternum slightly < 1.5 times as long as wide at apex. Terminal abdominal sternum in male quadrisetose.

Legs. Two basal tarsomeres of the male protarsus barely widened, faintly squamose underneath, and mediad extremely indistinctly triangularly dentate.

Male genitalia (Fig. 5). Aedeagus short and compact, very stout in apical half, lower surface slightly concave. Apex very short and widely rounded; internal sac with several slightly twisted but little sclerotized folds. Parameres very dissimilar, the left one very large, triangular, the right one smaller, both with three elongate apical setae.

Female gonocoxites. Unknown.

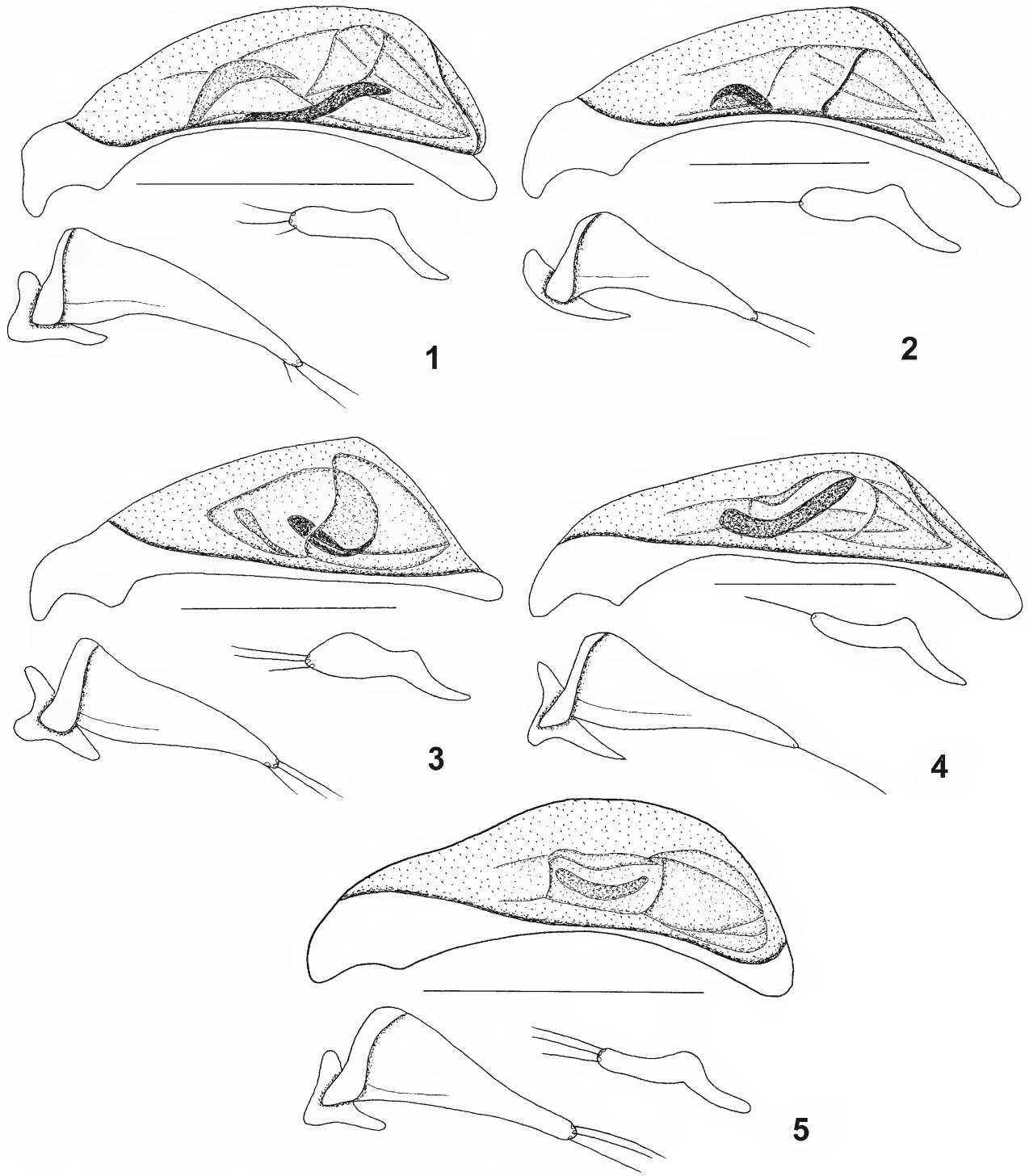
Variation. Unknown.

Distribution

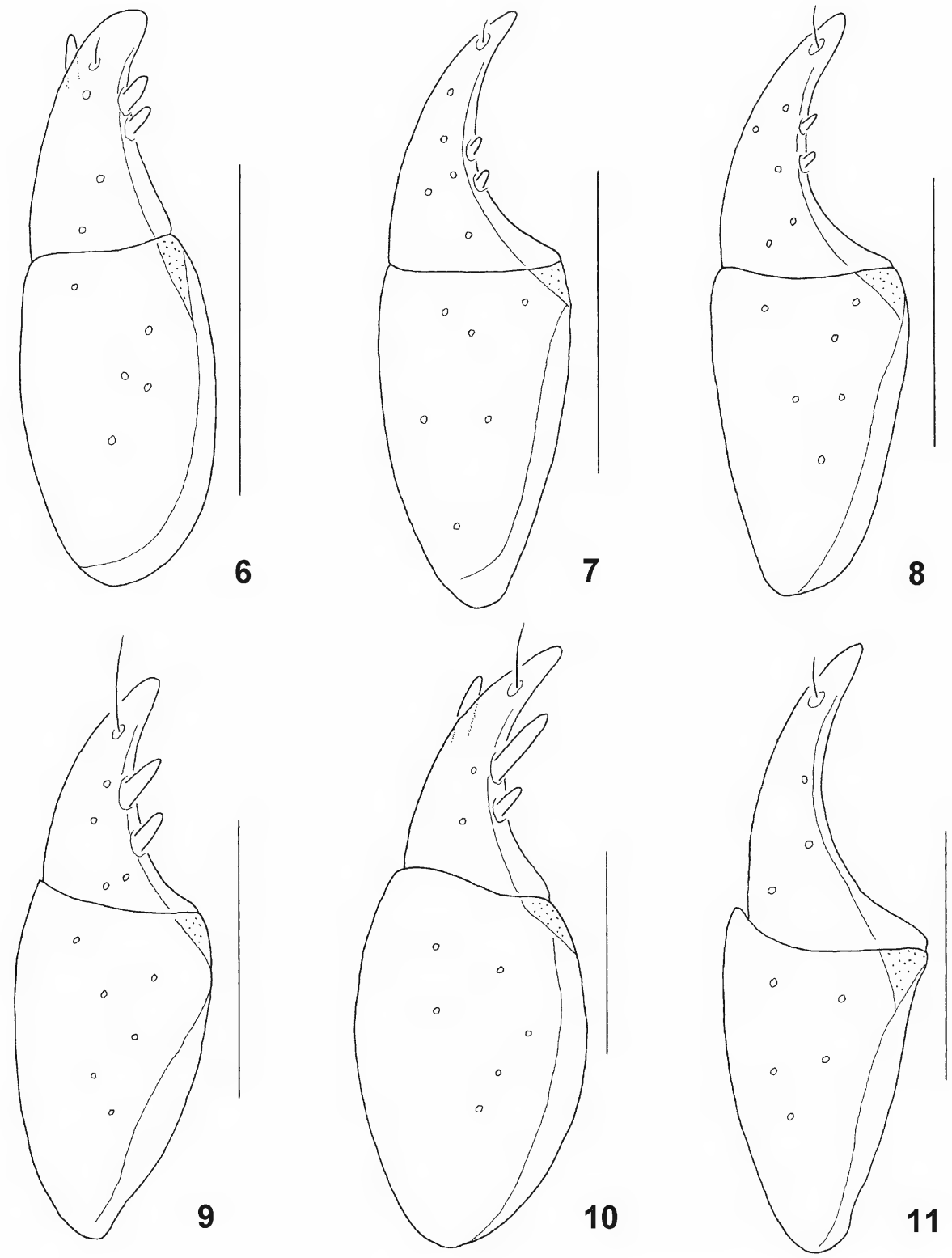
Sabah, Borneo. Known only from type locality.

Collecting circumstances

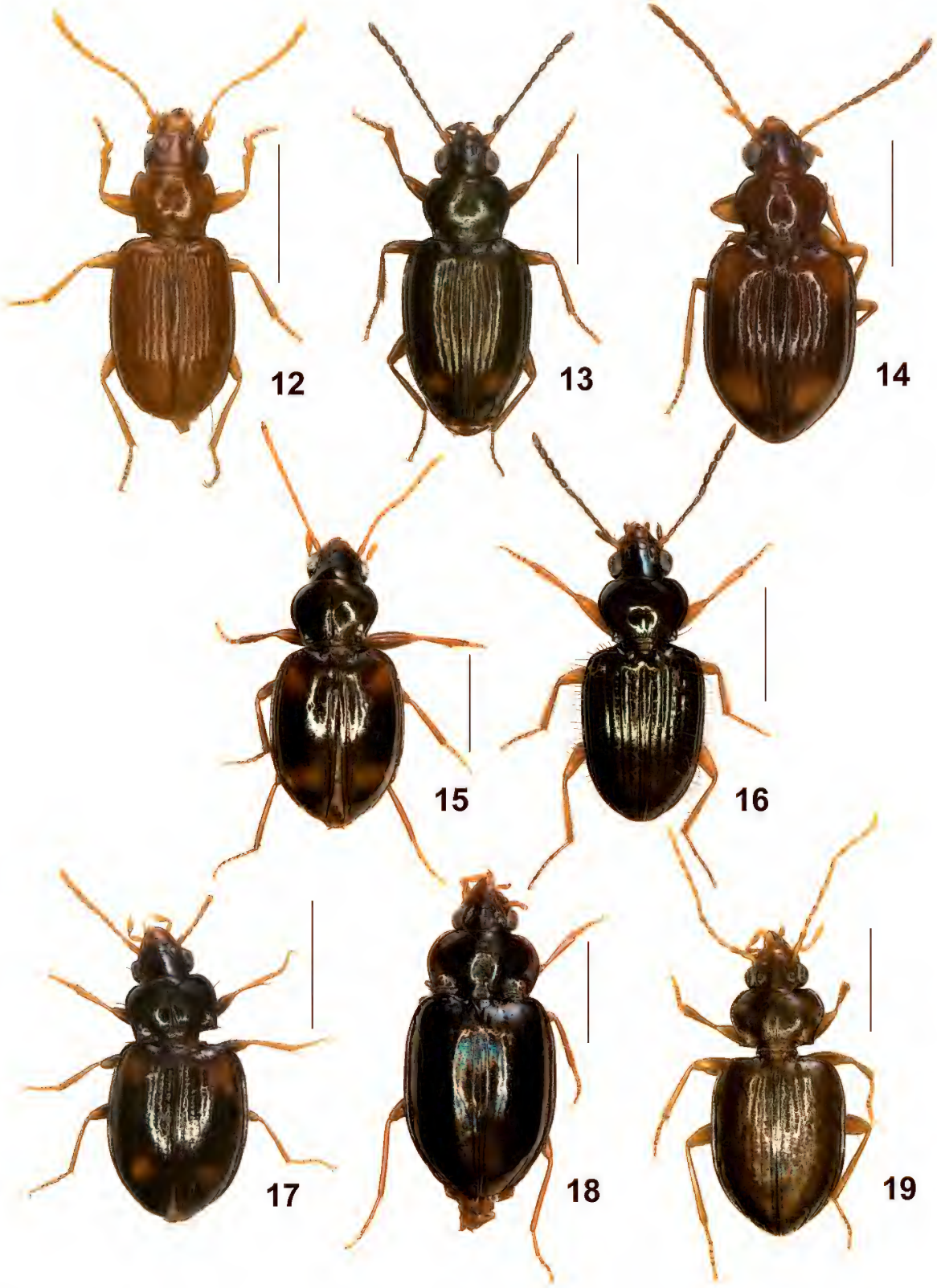
Not recorded.



Figs. 1-5. Male genitalia, aedeagus left side, right and left parameres. – **1**. *Elaphropus serrulipennis* n. sp. **2**. *E. schawalleri* n. sp. **3**. *E. rufinus* n. sp. **4**. *E. martensi* n. sp. **5**. *E. grimmi* n. sp. – Scale bars: 0.2 mm.



Figs. 6-11. Female gonocoxites. – **6**. *Elaphropus serrulipennis* n. sp. **7**. *E. schawalleri* n. sp. **8**. *E. martensi* n. sp. **9**. *Tachyta (Paratachyta) quadrinotata* n. sp. **10**. *T. (Eurytachyta) laticollis* n. sp. **11**. *Paratachys leytensis* n. sp. – Scale bars: 0.2 mm.



Figs. 12-19. Habitus. – **12**. *Elaphropus serrulipennis* n. sp. **13**. *E. schawalleri* n. sp. **14**. *E. rufinus* n. sp. **15**. *E. martensi* n. sp. **16**. *E. grimmi* n. sp. **17**. *Tachyta (Paratachyta) quadrinotata* n. sp. **18**. *T. (Eurytachyta) laticollis* n. sp. **19**. *Paratachys leytensis* n. sp. – Scale bars: 1 mm.

Relationships

In body shape and structure of elytra very similar, and probably closely related, to *E. barringtoni* (Andrewes, 1925) from the Philippines and *E. interpunctatus* (Putzeys, 1875) from Sulawesi.

4 Genus *Tachyta* Kirby, 1837

Tachyta Kirby, 1837: 56. – Csiki 1928: 166; Erwin 1975: 5; Sciaky & Vigna Taglianti 2003: 92; Kopecký 2003: 277; Lorenz 2005: 207; Baehr 2014b: 8.

Type species: *Tachyta picipes* Kirby, 1837, by monotypy [= *Tachyta nana inornata* (Say, 1823)].

Diagnosis

The genus is characterized by absence of deep mental pits, elongate terminal palpomeres, finely serrulate tarsal claws, and a straight, elongate recurrent stria that runs close to the lateral margin of the elytra.

Three subgenera have been described, two of which occur in the Oriental region, namely the nominate subgenus that covers depressed, mostly strongly microreticulated species, and *Paratachyta* Erwin, 1973 that includes a few small, less depressed, glabrous species. The third subgenus *Australotachyta* Baehr, 2013, is only known from northern Australia.

An additional subgenus is herein described for a single species of quite aberrant body shape that, however, possesses all determining character states of the genus.

4.1 Subgenus *Paratachyta* Erwin, 1975

Paratachyta Erwin, 1975: 7. – Sciaky & Vigna Taglianti 2003: 92; Kopecký 2003: 277; Lorenz 2005: 207.

Type species: *Tachys coracinus* Putzeys, 1875, by original designation.

Diagnosis

The subgenus originally was characterized by moderately convex body shape, glabrous surface, and presence of only the 1st and 8th elytral striae. In the meantime, however, a few species have been described that match body shape and glabrous surface, but possess more than one discal stria. The new species below likewise belongs to this group.

Description of *Tachyta (Paratachyta) quadrinotata* **n. sp.** (Figs. 9, 17)

Holotype (♀): "320 Ilam Distr., betw. Hodia Khola Valley to Sktia, 250–500 m, Shorea forest, dry, 7 Apr 1988, Martens & Schawaller leg. / Nepal-Expeditionen Jochen Martens" (SMNS).

Etymology

The species name refers to the quadrimaculate elytra.

Diagnosis

Characterized by presence of three elytral striae and traces of additional ones, and glabrous, not microreticulate, quadrimaculate elytra. Distinguished from the similarly quadrimaculate species *T. quadriplagiata* Baehr, 2014 from Vietnam by lesser body size, shorter elytra, presence of only three, instead of five well developed elytral striae, and dark femora.

Description

Measurements and ratios. Body length: 2.25 mm; width: 1.05 mm. Ratios: Width/length of pronotum: 1.45; widest diameter/width of base of pronotum: 1.11; width of pronotum/width of head: 1.43; length/width of elytra: 1.33.

Colour (Fig. 17). Black, elytra with two pale red spots. The humeral spot extended from 4th interval to margin but not touching the base, the apical spot extended between 3rd and 6th interval and far removed from apex. Palpi, antenna, and legs bright yellow, but femora infuscate.

Head (Fig. 17). Of average size. Eye large, laterad well produced, orbit very small. Labrum anteriorly straight. Clypeus straight, clypeal suture barely indicated. Frons convex, without any impression. Frontal furrows elongate, deep, curved, attaining the posterior margin of the eye. Apical palpomeres elongate. Antenna short, 7th–10th antennomeres slightly longer than wide. Dorsal surface impunctate and without microreticulation, very glossy, only labrum with superficial, isodiametric microreticulation.

Pronotum (Fig. 17). Wide, at base about as wide as in middle, narrowed to apex; dorsal surface gently convex. Apex with very shallow excision, apical angles barely projected and very widely rounded. Lateral border in basal half very slightly concave. Base laterally straight, in middle faintly produced, basal angles rectangular. Lateral sulcus deep, anteriorly narrow, basad slightly widened. Apex laterally finely margined, base laterally margined. Median line deeply sulcate, deepened basad, attaining apex and base. Anterior transverse impression only in parts perceptible, posterior impression deep, smooth, in middle with an elongate sulcus. Basal grooves barely perceptible, base near lateral margin with a short, slightly oblique carina. Anterior lateral seta inserted at apical third, posterior lateral seta inserted at basal angle. Surface impunctate, without microreticulation, very glossy.

Elytra (Fig. 17). Wide and short, oviform, lateral margin even in middle slightly convex; dorsal surface moderately convex. Three median striae distinct, though 3rd stria very short; only finest traces of additional striae visible. Median striae coarsely punctate, on disk impressed, 2nd and 3rd behind middle very weak, apical half widely glabrous. Two median intervals on disk slightly raised. 8th

stria only in apical half present. Recurrent stria deep, elongate, oblique, situated close to the lateral margin, at end slightly incurved. Third interval bipunctate, the anterior puncture located at basal quarter and adjacent to 4th stria, the posterior puncture located in apical third and adjacent to 3rd stria. Intervals with a few extremely inconspicuous punctures. Microreticulation absent, surface very glossy.

Lower surface. Prosternum and mesosternum in middle with sparse, very short, erect pilosity. Abdomen not pilose. Metepisternum c. 1.3 times as long as wide at apex. Terminal abdominal sternum in female quadrisetose.

Male genitalia. Unknown.

Female gonocoxites (Fig. 9). Gonocoxite 1 comparatively large, markedly triangular, without any setae. Gonocoxite 2 fairly elongate, triangular, slightly curved, with fairly acute apex, with two large ventro-lateral ensiform setae and one very elongate subapical nematiform seta that origins from a circular pit.

Variation. Unknown.

Distribution

Nepal. Known only from type locality.

Collecting circumstances

Sampled in forested area in river valley but unknown whether by hand collecting or whether at light.

Relationships

In body shape and structure, and in coloration very similar, and probably closely related to *T. quadriplagiata* Baehr, 2014.

4.2 Subgenus *Eurytachyta* **n. subgen.**

Type species: *Eurytachyta laticollis*, n. sp., here designated.

Etymology

The name of the new subgenus refers to the wide pronotum of the single species.

Diagnosis

Subgenus of *Tachyta* Kirby, 1837 by virtue of absence of pits on the labrum, finely serrulate tarsal claws, and the elongate, straight recurrent stria that runs close to the lateral margin of the elytra.

Special characteristics are the remarkably wide pronotum with convex lateral margins and excised lateral parts of the base, short and wide, absolutely glabrous elytra, presence of a deeply impressed sutural stria and a very weak 2nd stria, total absence of the 8th stria, and insertion of both discal setae at the position of the 3rd stria.

The single species *Eurytachyta laticollis* has been recorded from Sabah, Borneo. For full description of the new subgenus see the description of that species.

In various respects this subgenus differs markedly from the three other subgenera of *Tachyta*, and likely it could be taken for a separate genus. However, the structure of the recurrent stria, the minutely serrulate tarsal claws, and the narrow and elongate apical palpomere convinced me to include it as a subgenus into the genus *Tachyta*.

Description of *Tachyta (Eurytachyta) laticollis* **n. sp.** (Figs. 10, 18)

Holotype (♀): "Borneo, Sabah, Kinabalu NP, HQ vic., 1550 m, 22.–25.V.2005, R. Grimm" (CBM).

Etymology

The name refers to the unusual width of the pronotum.

Diagnosis

A large, wide species, characterized by the very wide, laterally markedly convex pronotum, in the middle strongly produced base and deeply excised lateral parts of the base, and wide, glabrous elytra with a well developed sutural stria and a very weak 2nd stria.

Description

Measurements and ratios. Body length: 3.1 mm; width: 1.45 mm. Ratios: Width/length of pronotum: 1.62; widest diameter/width of base of pronotum: 1.16; width of pronotum/width of head: 1.72; length/width of elytra: 1.43.

Colour (Fig. 18). Upper and lower surfaces black, iridescent, elytra unspotted, but margins of pronotum and elytra inconspicuously paler. Two basal antennomeres yellow (rest broken). Palpi and legs yellow.

Head (Fig. 18). Rather wide and short. Eye large, laterad well produced, orbit very small, almost perpendicular. Labrum anteriorly straight. Clypeus straight, clypeal suture barely indicated. Frons convex, without any impression. Frontal furrows elongate, deep, oblique, slightly surpassing middle of eye. Apical palpomeres elongate. Both antennae broken from 3rd antennomere. Dorsal surface impunctate and without microreticulation, very glossy, only labrum with superficial, isodiametric microreticulation.

Pronotum (Fig. 18). Very wide, at base much wider than at apex, strongly narrowed to apex; dorsal surface rather convex. Apex straight, apical angles very widely rounded. Lateral border markedly convex, even near base not concave. Base in middle remarkably produced, lateral parts deeply excised, therefore the rectangular basal angles slightly produced posteriad. Lateral sulcus wide and deep, basad slightly widened. Apex completely margined, base laterally margined. Median line very inconspicuous, not impressed, neither attaining apex nor base.

Anterior transverse impression not perceptible, posterior impression deep, smooth, in middle widely interrupted. Basal grooves circular, deep, base near lateral margin with a short, oblique, not carinate swelling. Anterior lateral seta inserted very close to apex, posterior lateral seta inserted at basal angle. Surface impunctate, without microreticulation, very glossy and iridescent.

Elytra (Fig. 18). Moderately elongate, not oviform, lateral margin in middle straight; dorsal surface convex. Humerus evenly rounded. Sutural stria distinct and well impressed, smooth, 2nd stria very inconspicous and only visible in basal half, other striae virtually absent. Only the sutural intervals raised. 8th stria completely absent. Recurrent stria deep, very elongate, oblique, situated close to the lateral margin, at end slightly incurved and ending in a pit. Surface bipunctate, both punctures located at position of 3rd stria; the anterior puncture located at basal sixth, the posterior in apical third. Surface impunctate and without microreticulation, very glossy and iridescent.

Lower surface. Prosternum and mesosternum apparently glabrous. Abdomen not pilose. Metepisternum slightly < 1.5 times as long as wide at apex. Terminal abdominal sternum in female quadrisetose.

Male genitalia. Unknown.

Female gonocoxites (Fig. 10). Gonocoxite 1 very large, triangular and globose, without any setae. Gonocoxite 2 fairly elongate, triangular, slightly curved, with acute apex, with two elongate, narrow ventro-lateral ensiform setae, the upper one being longer, one elongate dorsomedian ensiform seta, and one elongate subapical nematiform seta that origins from a circular pit.

Variation. Unknown.

Distribution

Sabah, Borneo. Known only from type locality.

Collecting circumstances

Not recorded, but, according to the collector, probably sampled at light.

5 Genus *Paratachys* Casey, 1918

Paratachys Casey, 1918: 174. – Sciaky & Vigna Taglianti 2003: 91; Kopecký 2003: 275; Lorenz 2005: 215.

Type species: *Paratachys austicinus* Casey, 1918, by original designation.

Diagnosis

The genus is characterized by presence of deep mental pits, not duplicated, curved frontal furrows, smooth tarsal claws, absence of a carina at the basal angle of the pronotum, presence of two elytral punctures on disk, interrupted 8th elytral stria, presence of an elongate, at end incurved recurrent stria that is situated rather in the middle of the elytra, and presence of a setiferous puncture right in the curvature of the recurrent stria.

The genus is congruent with the *triangularis*-group of Andrewes (1925).

Description of *Paratachys leytensis* **n. sp.** (Figs. 11, 19)

Holotype (♀): "Philippines, Leyte, visca N Baybay, 1991, sec. forest, 100–200 m, leg. Schawaller & al. / 11.III.1991" (SMNS).

Paratype (♀): same locality, but 27.II.1991 (CBM).

Etymology

The name refers to the occurrence of this species on the island of Leyte.

Diagnosis

Characterized by unicolourous, reddish-piceous, markedly iridescent colour, wide, cordiform pronotum, remarkably short and wide elytra, location of the anterior discal puncture at 4th stria, and elongate, straight recurrent stria with the puncture just inside the short apical curvature. Distinguished from all Oriental and Papuan species with similar structure of the elytra [e. g. *P. fasciatus* (Motschulsky, 1851)] by the remarkably short elytra.

Description

Measurements and ratios. Body length: 2.85–2.95 mm; width: 1.30–1.35 mm. Ratios: Width/length of pronotum: 1.60–1.62; widest diameter/width of base of pronotum: 1.26–1.27; width of pronotum/width of head: 1.50; length/width of elytra: 1.39–1.41.

Colour (Fig. 19). Upper and lower surfaces unicolourous reddish-piceous, markedly iridescent. Antenna, palpi, and legs yellow.

Head (Fig. 19). Rather wide. Eye large, but laterad moderately produced, orbit short, oblique-convex, c. 1/5 of length of eye. Labrum anteriorly straight. Clypeus straight, clypeal suture distinct. Frons convex, without any impression. Frontal furrows elongate, wide, and deep, evenly curved, not duplicated, anteriorly slightly crossing to the clypeus, attaining the posterior margin of the eye. Sulcus medially of the eye deep. Mandible elongate, little curved. Palpi elongate, pilose, apical palpomeres narrow, fairly elongate. Antenna elongate, 7th–10th antennomeres c. 2.25–2.50 times as long as wide. Dorsal surface impunctate, with slightly superficial, isodiametric microreticulation, moderately glossy but rather iridescent.

Pronotum (Fig. 19). Wide, at base wider than at apex; dorsal surface gently convex. Apex with fairly deep excision, apical angles projected but widely rounded. Lateral border in anterior three fourths very convex, in basal fourth oblique and very slightly concave. Base laterally straight, in middle slightly produced, basal angles acute, about 100°. Lateral sulcus rather wide, basad slightly widened. Apex laterally finely margined, base not margined except near basal angles. Median line distinct, slightly impressed, deepened basad, neither attaining apex nor base. Anterior transverse impression barely perceptible, posterior impression deep, distinctly crenulate, in middle with a deep sulcus. Basal grooves deep, base without a carina. Anterior lateral seta inserted slightly in front of middle and of widest diameter, posterior lateral seta inserted at basal angle. Surface impunctate, only near apex and base with faint microreticulation, glossy and iridescent. The area behind the basal sulcus with some longitudinal sulci.

Elytra (Fig. 19). Wide and remarkably short, not oviform, lateral margin in middle straight, very wide at humerus; dorsal surface moderately convex but depressed on disk. Humerus widely rounded, basal margin incomplete, attaining c. level of 4th stria. Four or five striae more or less distinctly impressed, but less so laterad, other striae very inconspicuous, not impressed and only consisting of an inconspicuous row of fine punctures. The median striae more or less distinctly crenulate. At least 1st–5th striae attaining the base. All striae except the sutural one ending far in front of apex, the outer ones gradually more shortened than the inner ones, apex widely glabrous. Median intervals on disk slightly raised. 8th stria in apical half distinct and impressed, basad faded away, impunctate. Recurrent stria deep, elongate, oblique, at end incurved. 3rd interval bipunctate, the anterior puncture located at basal third adjacent to 4th stria, the posterior puncture located just inside the short apical curvature of the recurrent stria. Surface impunctate and without microreticulation, very glossy and iridescent.

Lower surface. Not pilose, glabrous. Metepisternum c. 1.75 times as long as wide at apex. Terminal abdominal sternum in female quadrisetose.

Legs. Shape and squamosity of male protarsus unknown.

Male genitalia. Unknown.

Female gonocoxites (Fig. 11). Gonocoxite 1 elongate, triangular, without any setae. Gonocoxite 2 elongate, triangular, slightly curved, with acute apex; both, the ventrolateral ensiform setae and the dorso-median ensiform seta absent; one short subapical nematiform seta present and originating from a circular pit.

Variation. Very little variation noted.

Distribution

Island of Leyte, Philippines. Known only from type locality.

Collecting circumstances

Sampled in forested area at low altitude, but unknown whether by hand collecting, whether at light.

Relationships

Within the Oriental species of *Paratachys* that have the anterior discal puncture adjacent to the 4th stria, distinguished by the very short elytra, therefore relationships uncertain.

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A revision of *Zyras* Stephens sensu strictu of China, Taiwan, and Hong Kong, with records and (re-)descriptions of some species from other regions (Coleoptera: Staphylinidae: Aleocharinae: Lomechusini)

Volker Assing

Abstract

The species of the nominal subgenus of the lomechusine genus *Zyras* Stephens, 1835 of China, Taiwan, and Hong Kong are revised. In all, 50 named species, two of them of doubtful identity, are recognized, (re-)described, and illustrated, among them 33 new taxa: *Zyras (Zyras) athetoides* **n. sp.** (Sichuan), *Z. (Z.) atrapicalis* **n. sp.** (Yunnan), *Z. (Z.) atronitens* **n. sp.** (Tibet), *Z. (Z.) bangmaicus* **n. sp.** (Yunnan), *Z. (Z.) bicoloricollis* **n. sp.** (Yunnan), *Z. (Z.) bisinuatus* **n. sp.** (Yunnan), *Z. (Z.) caloderoides* **n. sp.** (Yunnan), *Z. (Z.) dabanicus* **n. sp.** (Qinghai), *Z. (Z.) discolor* **n. sp.** (Fujian), *Z. (Z.) exspoliatus* **n. sp.** (Guangxi), *Z. (Z.) extensus* **n. sp.** (Yunnan), *Z. (Z.) firmicornis* **n. sp.** (Fujian), *Z. (Z.) flexus* **n. sp.** (Fujian), *Z. (Z.) formosanus* **n. sp.** (Taiwan), *Z. (Z.) gilvipalpis* **n. sp.** (Yunnan), *Z. (Z.) granapicalis* **n. sp.** (Sichuan), *Z. (Z.) hebes* **n. sp.** (Taiwan), *Z. (Z.) inexcisus* **n. sp.** (China: Gansu, Qinghai; Russia: Far East, East Siberia), *Z. (Z.) lativentris* **n. sp.** (Yunnan), *Z. (Z.) maculicollis* **n. sp.** (Yunnan), *Z. (Z.) nigrapicalis* **n. sp.** (Yunnan, Sichuan, Jiangxi, Taiwan), *Z. (Z.) nigricornis* **n. sp.** (Hubei, Gansu, Shaanxi, Sichuan, Qinghai), *Z. (Z.) nigronitens* **n. sp.** (Yunnan), *Z. (Z.) pulcher* **n. sp.** (Gansu, Sichuan), *Z. (Z.) rectus* **n. sp.** (Yunnan), *Z. (Z.) rufapicalis* **n. sp.** (Taiwan), *Z. (Z.) rufoterminalis* **n. sp.** (Hubei, Sichuan), *Z. (Z.) schuelkei* **n. sp.** (Fujian, Sichuan), *Z. (Z.) subobsoletus* **n. sp.** (Sichuan), *Z. (Z.) tenebricosus* **n. sp.** (Sichuan, Tibet), *Z. (Z.) tenuicornis* **n. sp.** (Taiwan), *Z. (Z.) tumidicornis* **n. sp.** (Taiwan), *Z. (Z.) volans* **n. sp.** (Taiwan). Previous records of five species from China are considered doubtful. As many as 19 species remain unnamed for want of mature males. A catalogue and a key to species are provided. The distributions of 46 species are mapped. Additional records and (re-)descriptions of 15 species from other – Palaearctic and Oriental – regions are provided. Two species are described for the first time: *Z. (Z.) iniquus* **n. sp.** (Pakistan) and *Z. (Z.) articollis* **n. sp.** (Laos). Seven synonymies and a new combination are proposed: *Zyras beijingensis* Pace, 1993 = *Z. restitutus* Pace, 1993, **n. syn.**; *Zyras alboantennatus* Pace, 1986 = *Z. sichuanorum* Pace, 2012, **n. syn.**; *Z. birmanus* Scheerpeltz, 1965 = *Z. pseudobirmanus* Scheerpeltz, 1965, **n. syn.**; *Z. hongkongensis* Pace, 1999 = *Z. benenensis* Pace, 2001, **n. syn.**; *Z. kambaitiensis* Scheerpeltz, 1965 = *Z. ferrugineiventris* Scheerpeltz, 1965, **n. syn.**, = *semiasperatus* Scheerpeltz, 1965, **n. syn.**; *Z. wei* Pace, 1993 = *Z. qingchengensis* Pace, 2012, **n. syn.**; *Zyras brignolii* (Pace, 1986), **n. comb.** (ex *Drusilla*). Lectotypes are designated for *Zyras chinkiangensis* Bernhauer, 1939 and *Z. seminigerrimus* Bernhauer, 1933.

Keywords: Coleoptera, Staphylinidae, Aleocharinae, Lomechusini, *Zyras*, China, Taiwan, Hong Kong, Palaearctic region, Oriental region, taxonomy, zoogeography, descriptions, new species, new synonymies, new combination, lectotype designations, key to species, catalogue, distribution maps.

Zusammenfassung

Die Arten der Untergattung *Zyras* Stephens, 1835 sensu strictu Chinas, Taiwans und Hongkongs werden revidiert. Insgesamt 50 benannte Arten, davon zwei von zweifelhafter Identität, werden erkannt, beschrieben bzw. redeskribiert und abgebildet, darunter 33 neue Taxa: *Zyras (Zyras) athetoides* **n. sp.** (Sichuan), *Z. (Z.) atrapicalis* **n. sp.** (Yunnan), *Z. (Z.) atronitens* **n. sp.** (Tibet), *Z. (Z.) bangmaicus* **n. sp.** (Yunnan), *Z. (Z.) bicoloricollis* **n. sp.** (Yunnan), *Z. (Z.) bisinuatus* **n. sp.** (Yunnan), *Z. (Z.) caloderoides* **n. sp.** (Yunnan), *Z. (Z.) dabanicus* **n. sp.** (Qinghai), *Z. (Z.) discolor* **n. sp.** (Fujian), *Z. (Z.) exspoliatus* **n. sp.** (Guangxi), *Z. (Z.) extensus* **n. sp.** (Yunnan), *Z. (Z.) firmicornis* **n. sp.** (Fujian), *Z. (Z.) flexus* **n. sp.** (Fujian), *Z. (Z.) formosanus* **n. sp.** (Taiwan), *Z. (Z.) gilvipalpis* **n. sp.** (Yunnan), *Z. (Z.) granapicalis* **n. sp.** (Sichuan), *Z. (Z.) hebes* **n. sp.** (Taiwan), *Z. (Z.) inexcisus* **n. sp.** (China: Gansu, Qinghai; Russland: Ferner Osten, Ostsibirien), *Z. (Z.) lativentris* **n. sp.** (Yunnan), *Z. (Z.) maculicollis* **n. sp.** (Yunnan), *Z. (Z.) nigrapicalis* **n. sp.** (Yunnan, Sichuan, Jiangxi, Taiwan), *Z. (Z.) nigricornis* **n. sp.** (Hubei, Gansu, Shaanxi, Sichuan, Qinghai), *Z. (Z.) nigronitens* **n. sp.** (Yunnan), *Z. (Z.) pulcher* **n. sp.** (Gansu, Sichuan), *Z. (Z.) rectus* **n. sp.** (Yunnan), *Z. (Z.) rufapicalis* **n. sp.** (Taiwan), *Z. (Z.) rufoterminalis* **n. sp.** (Hubei, Sichuan), *Z. (Z.) schuelkei* **n. sp.** (Fujian, Sichuan), *Z. (Z.) subobsoletus* **n. sp.** (Sichuan), *Z. (Z.) tenebricosus* **n. sp.** (Sichuan, Tibet), *Z. (Z.) tenuicornis* **n. sp.** (Taiwan), *Z. (Z.) tumidicornis* **n. sp.** (Taiwan), *Z. (Z.) volans* **n. sp.** (Taiwan). Frühere Nachweise von fünf Arten aus China werden als zweifelhaft betrachtet. Insgesamt 19 Arten werden nicht benannt, da mature Männchen bislang fehlen. Ein Katalog und eine Bestimmungstabelle werden erstellt. Die derzeit bekannten Verbreitungsgebiete von 46 Arten werden anhand von Karten illustriert. Von 15 Arten aus anderen Regionen der Paläarktis und Orientalis werden weitere Nachweise gemeldet oder Beschreibungen bzw. Redeskriptionen gegeben. Zwei Arten werden erstmals beschrieben: *Zyras (Z.) iniquus* **n. sp.** (Pakistan) und *Z. (Z.) articollis* **n. sp.** (Laos). Sieben Namen

werden synonymisiert und eine Neukombination wird vorgenommen: *Zyras beijingensis* Pace, 1993 = *Z. restitutus* Pace, 1993, **n. syn.**; *Zyras alboantennatus* Pace, 1986 = *Z. sichuanorum* Pace, 2012, **n. syn.**; *Z. birmanus* Scheerpeltz, 1965 = *Z. pseudobirmanus* Scheerpeltz, 1965, **n. syn.**; *Z. hongkongensis* Pace, 1999 = *Z. benenensis* Pace, 2001, **n. syn.**; *Z. kambaitiensis* Scheerpeltz, 1965 = *Z. ferrugineiventris* Scheerpeltz, 1965, **n. syn.**, = *semiasperatus* Scheerpeltz, 1965, **n. syn.**; *Z. wei* Pace, 1993 = *Z. qingchengensis* Pace, 2012, **n. syn.**; *Zyras brignolii* (Pace, 1986), **n. comb.** (ex *Drusilla*). Für *Zyras chinkiangensis* Bernhauer, 1939 und *Z. seminigerrimus* Bernhauer, 1933 werden Lectotypen designert.

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1 Introduction

According to a recent catalogue of the Lomechusini of the world, the nominal subgenus of the speciose genus *Zyras* Stephens, 1835 included 121 species, plus one nomen nudum (Hlaváč et al. 2011). Eight additional species from India, China, Thailand, and Vietnam were subsequently described by Pace (2011, 2012a, b) and Assing (2015d). Thus, the subgenus previously comprised a total of 129 species, twelve from the Afrotropical region southwards to South Africa, seven from the Australian region (New Guinea and Australia), three from the Nearctic region, two from the Neotropics, and five from the West Palaearctic including Middle Asia. The remaining 92 species are distributed in the East Palaearctic and Oriental regions. As many as 18 species have been recorded from India, 16 from China, 15 from Malaysia, 15 from Indonesia (exclusive of West Papua), eleven from Burma, and ten from Nepal, followed by Japan (7), Thailand (7), Taiwan (5), Korea (5), Sri Lanka (5), Vietnam (5), Hong Kong (3), the Philippines (2), Cambodia (1), and Mongolia (1). These figures, however, should be considered tentative. Hlaváč et al. (2011) list as many as 123 species as *Zyras* incertae sedis. They have not been subject to modern revisions and the number of species actually belonging to the nominal subgenus is unknown. Moreover, additional species may be hiding in other genera of Lomechusini such as *Drusilla* Leach, 1819 (see section on *Z. brignolii* in this paper) or may have been confounded with other species. On the other hand, numerous species currently assigned to the subgenus *Zyras* have not been revised and the possibility that they in fact belong to other (sub-)genera cannot be ruled out.

Little is known about the bionomics of the species of *Zyras* sensu strictu. According to Horion (1967), one of the three European species, *Z. haworthi* (Stephens, 1832), is myrmecophilous and associated with *Lasius fuliginosus* (Latreille, 1798), whereas the other two species, *Z. collaris* (Paykull, 1789) and *Z. fulgidus* (Gravenhorst, 1806), are mostly found in moist habitats such as bogs, meadows, etc., only rarely with ants such as *Lasius fuliginosus* or *Myrmica* spp. (*Z. collaris*), and in forest margins, by sweeping the vegetation of meadows, or in other habitats, occasionally also with ants such as *Lasius brunneus* (Latreille, 1798) or *Camponotus* spp. (*Z. fulgidus*). Maruyama et al. (2013) state that the Japanese species *Z. pictus* (Sharp, 1874) is associated mainly with *Lasius* spp., feeds on dead ants, and scavenges the ants' food. All the specimens of *Zyras* sensu strictu collected by myself were mainly caught with pitfall traps (West Palaearctic; see also Assing 1994) or sifted from leaf litter and debris (China) without evident association with ants.

The first three species of *Zyras* sensu strictu from China, Taiwan, and Hong Kong were described by Bernhauer (1933a, 1933b, 1939). Rather recently, 13 species were described by Pace (1993, 1998, 1999, 2010a, 2012a), some of them exclusively based on females. The type localities of seven of the *Zyras* species described from Burma by Scheerpeltz (1965) are situated practically at the border with the Chinese province Yunnan, so that it seemed likely that these species were present in China, too. Several additional species originally described from other regions were more or less doubtfully recorded from China and Taiwan, e. g., *Z. hirtus* (Kraatz, 1859) (originally from Sri Lanka) from Taiwan by Pace (2010a). For a complete list of these records see the catalogue provided in this paper.

Previous studies of various genera of Lomechusini such as *Orphnebius* Motschulsky, 1858, *Tetrabothrus* Bernhauer, 1915, *Amaurodera* Fauvel, 1905, and *Pella* Stephens, 1833 have shown that the lomechusine fauna of China is remarkably diverse (Assing 2006a, b, 2009, 2015a–c). A preliminary examination of some Chinese material of *Zyras* sensu strictu suggested that this also, and particularly, applied to this subgenus. The present study is based primarily on material collected during two field trips to China, the first conducted together with Michael Schülke and David Wrase (both Berlin) and the second together with Michael Schülke, as well as on material from the private collection of Michael Schülke collected during nine previous field trips to China from the mid-1990s to 2010. Additional material came from various other public and private collections.

Acknowledgements

My thanks are due to the colleagues indicated in the material section for the loan of material from the collections under their care. In particular, I am grateful to Benedikt Feldmann (Münster), Peter Hlaváč (Praha), Guillaume de Rougemont (Oxford), Aleš Smetana (Ottawa), and above all Michael Schülke (Berlin) for the generous permission to retain important reference specimens, including holotypes. Munetoshi Maruyama (Fukuoka) confirmed the identification of *Zyras pictus* and kindly provided reference material of most of the species of *Zyras* sensu strictu from Japan, as well as a photograph of the holotype of *Z. sibiricus*. Al Newton (Chicago) cross-checked all the new names against his unpublished data base. Only thanks to Adriano Zanetti (Verona) was it possible to examine the type material of two species deposited in the Verona museum.

2 Material and methods

The material treated in this study is deposited in the following collections:

cAss	Author's private collection
cFel	Private collection Benedikt Feldmann, Münster
cHla	Private collection Peter Hlaváč, Praha
cMar	Private collection Munetoshi Maruyama, Fukuoka
cPüt	Private collection Andreas Pütz, Eisenhüttenstadt
cRou	Private collection Guillaume de Rougemont, Oxford
cSch	Private collection Michael Schülke, Berlin
cSme	Private collection Aleš Smetana, Ottawa
FMNH	Field Museum of Natural History, Chicago (C. Maier)
MCSNV	Museo Civico di Storia Naturale, Verona (L. Latella, via A. Zanetti)
MHNG	Muséum d'Histoire Naturelle, Genève (G. Cuccodoro)
MNHUB	Museum für Naturkunde der Humboldt-Universität Berlin (J. Frisch, J. Willers)
NHMB	Naturhistorisches Museum Basel (M. Geiser, I. Zürcher)
NHMW	Naturhistorisches Museum Wien (H. Schillhammer)
NME	Naturkundemuseum Erfurt (M. Hartmann)
NMP	National Museum of Natural History, Praha (J. Hájek)
SDEI	Senckenberg Deutsches Entomologisches Institut, Müncheberg (L. Behne)
SMNH	Swedish Museum of Natural History, Stockholm (J. Bergsten)

The morphological studies were conducted using a Stemi SV 11 microscope (Zeiss Germany) and a Jenalab compound microscope (Carl Zeiss Jena). The images of external characters were created using a photographing device constructed by Arved Lompe (Nienburg) and CombineZ software. A digital camera (Nikon Coolpix 995) was used for the remaining photographs. The maps were created using MapCreator 2.0 (primap) software.

Body length was measured from the anterior margin of the labrum to the abdominal apex, the length of the forebody from the anterior margin of the labrum to the posterior margin of the elytra, head length from the anterior margin of the clypeus (without ante-clypeus) to the posterior constriction of the head, elytral length at the suture from the apex of the scutellum to the posterior margin of the elytra, and the length of the aedeagus from the apex of the ventral process to the base of the aedeagal capsule. The "parameral" side (i. e., the side where the sperm duct enters) is referred to as the ventral, the opposite side as the dorsal aspect.

The individual labels of type specimens are separated by slashes; they are cited in the original spelling and format, except that slashes were replaced with commas. Moreover, the following adaptations were made according to the general format requirements of the journal: names of persons (except authors of species) in small capitals, scientific names of genera and species in italics, dates with the months always in Roman numbers (capitals).

3 The *Zyras* sensu strictu fauna of China, Taiwan, and Hong Kong

3.1 Diversity and biogeography

An examination of the *Zyras* sensu strictu material from China, Taiwan, and Hong Kong at hand revealed a remarkable diversity. Numerous new species were discovered in this material, 33 of which are described. Nearly 20 additional species, most (if not all) of which are undescribed, are represented only by females or teneral males and consequently remain unnamed. Additional undescribed species from Taiwan were seen in material sent to me by Munetoshi Maruyama, who will treat them in the context of one of his own studies. In all, 50 named species are now known from China, Taiwan, and Hong Kong. As can be inferred from the number of unnamed species examined, as well as from the fact that a considerable proportion of the species is known only from a single locality, the true diversity of *Zyras* sensu strictu in the study region is undoubtedly significantly greater.

With two exceptions (*Z. yongshengensis*, *Z. formosanus*), all the examined species are winged and probably capable of flight. Many of them have been collected also, or primarily, at lower altitudes. These observations

suggest that they are more or less widespread. Owing to the scarcity of material and the general rarity of collecting events, however, the ranges of the vast majority of species are poorly known. Among those species that have been collected less rarely, *Z. hongkongensis*, a species generally found at lower altitudes, is by far the most widespread, its distribution extending from northeastern India across South China to Indonesia. *Zyras inexcisus* has a more northern distribution and, accordingly, is widespread in North China, East Siberia, and the Russian Far East. *Zyras malaisei*, one of the larger species, has been recorded from Burma and Vietam, suggesting that it is present also in South China. Some species and even species groups, by contrast, appear to have more restricted ranges. The three species of the *Z. glabricollis* group, for instance, have been recorded only from northeastern Burma and northern Yunnan, and a number of other species appears to be confined to the mountainous regions of Yunnan, western Sichuan, and to Taiwan, although they are fully winged.

Disregarding doubtful records and species of doubtful identity, the provinces/regions with the greatest diversity are Yunnan (18 species; 12 of them exclusive), Sichuan (14; 5), and Taiwan (8; 6), followed by Fujian (5; 3), Gansu (5; 0), Hubei (4; 0), Beijing (3; 1), Guangxi (3; 1), Qinghai (3; 1), Zhejiang (3; 0), Shaanxi (3; 0), Tibet (2; 1), Hong Kong (2; 1), Jiangxi (2; 1), Jiangsu (1; 1), Guizhou (1; 0), and Guangdong (1; 0).

3.2 Taxonomy

Among the numerous subgenera of *Zyras*, the nominal subgenus is characterized particularly by the absence of conspicuous modifications (e. g., of the abdomen), by the absence of microsculpture on the whole body, a simple morphology of the median lobe of the aedeagus and of the paramere, a very uniform shape of the spermatheca with a short more or less comma-shaped distal portion and a long and thin coiled proximal portion, and by the general punctation pattern of the abdomen. The anterior impressions of tergites III–V and the anterior portions of tergites VI–VII mostly have more or less extensive non-setiferous puncturation (gland openings?), whereas the – usually sparse to very sparse – setiferous punctation is confined to the posterior and lateral portions, as well as the posterior margins of the tergites.

While, on the one hand, *Zyras* sensu strictu species display a remarkable diversity of coloration patterns, they are rather uniform in many other characters such as the general habitus, microsculpture, body size, the shapes of the abdominal tergite and sternite VIII, the shape of the paramere, particularly the shape of the spermatheca, and to some extent even the morphology of the median lobe of the aedeagus. The latter, in most groups of Aleocharinae of considerable taxonomic significance, is subject to relatively little interspecific variation in most species groups of *Zyras* sensu strictu, also because the internal structures are weakly sclerotized and consequently of little use for species identification. The spermatheca, which may provide highly reliable diagnostic characters in aleocharine taxa such as the Athetini and even in some lomechusine genera such as *Drusilla*, is remarkably uniform in *Zyras* sensu strictu species; for illustrations see, for example, the figures provided by Pace (1993, 1998, 2010a, 2012a). Since, in effect, the spermatheca is too uniform to be useful for species identification in *Zyras* sensu strictu, it is neither described nor illustrated in the species sections.

Aside from the coloration, which however may be subject to pronounced intraspecific variation in some species (e. g., *Z. haworthi*), the morphology of the antennae, the punctation (particularly that of the abdomen), as well as the shapes of the ventral process and the crista apicalis of the median lobe of the aedeagus provide the most reliable characters for the identification of *Zyras* sensu strictu species from China.

The present revision revealed a remarkable extent of misinterpretation and misidentification of previously identified type and non-type material. This confusion is most likely a result of an under- or overestimation of intraspecific variation, of the fact that several species had been described based exclusively on females or on teneral specimens, and that practically all the previous descriptions are insufficient for a reliable identification. For example, material previously identified by Roberto Pace, the author of the majority of the species previously described from China, as *Z. wei* Pace, 1993 and partly recorded as such from various provinces was composed of at least five species, although some of them (e. g., the species described as *Z. rufapicalis* below) are remarkably different from *Z. wei* in many respects. One of the lessons learnt from this observation is that all the previous records from China should be considered doubtful and require revision.

3.3 Catalogue of the species of *Zyras* sensu strictu recorded from China, Taiwan, and Hong Kong

alboantennatus Pace, 1986 (= *sichuanorum* Pace, 2012; n. syn.) – China: Sichuan, Yunnan; Burma; Vietnam
athetoides n. sp. – China: Sichuan
atrapicalis n. sp. – China: Yunnan
atronitens n. sp. – China: Tibet
bangmaicus n. sp. – China: Yunnan
beijingensis Pace, 1993 (= *restitutus* Pace, 1993; n. syn.) – China: Beijing, Gansu, Shaanxi, Zhejiang
bicoloricollis n. sp. – China: Yunnan
birmanus Scheerpeltz, 1965 (= *pseudobirmanus* Scheerpeltz, 1965; n. syn.) – China: Yunnan; Burma
bisinuatus n. sp. – China: Yunnan
caloderoides n. sp. – China: Yunnan
chinkiangensis Bernhauer, 1939 – China: Jiangsu

dabanicus n. sp. – China: Qinghai
discolor n. sp. – China: Fujian
exspoliatus n. sp. – China: Guangxi
extensus n. sp. – China: Yunnan
firmicornis n. sp. – China: Fujian
flexus n. sp. – China: Fujian
formosanus n. sp. – Taiwan
fratrumkadooriorum Pace, 1998 – Hong Kong
gibbus Pace, 2010 – Taiwan
gilvipalpis n. sp. – China: Yunnan
granapicalis n. sp. – China: Sichuan
hauserianus Bernhauer, 1933 – China: Xinjiang
hebes n. sp. – Taiwan
hongkongensis Pace, 1999 (= *benenensis* Pace, 2001; n. syn.) – China: Guangdong, Guangxi, Yunnan; Taiwan; Hong Kong; Northeast India; Vietnam; Indonesia
inexcisus n. sp. – China: Gansu, Qinghai; Russia: Far East, East Siberia
kambaitiensis Scheerpeltz, 1965 (=*ferrugineiventris* Scheerpeltz, 1965; n. syn., = *semiasperatus* Scheerpeltz, 1965; n. syn.) – China: Yunnan; Burma
lativentris n. sp. – China: Yunnan
maculicollis n. sp. – China: Hubei, Jiangxi
nigrapicalis n. sp. – China: Yunnan, Sichuan, Jiangxi; Taiwan
nigricornis n. sp. – China: Hubei, Gansu, Shaanxi, Sichuan, Qinghai
nigronitens n. sp. – China: Yunnan
notaticornis Pace, 1998 – China: Guangxi, Zhejiang; Hong Kong
pulcher n. sp. – China: Gansu, Sichuan
rectus n. sp. – China: Yunnan
rufapicalis n. sp. – Taiwan
rufoterminalis n. sp. – China: Hubei, Sichuan
schuelkei n. sp. – China: Fujian, Sichuan
seminigerrimus Bernhauer, 1933 – China: Sichuan
shaanxiensis Pace, 1998 – China: Gansu, Hubei, Shaanxi, Sichuan, Yunnan?
sibiricus Bernhauer, 1914 – China: Beijing; Russia (East Siberia); North Korea; Japan
song Pace, 1993 – China: Yunnan
songanus Pace, 1993 – China: Beijing
subobsoletus n. sp. – China: Sichuan
tenebricosus n. sp. – China: Sichuan, Tibet
tenuicornis n. sp. – Taiwan
tumidicornis n. sp. – China: Sichuan, Yunnan
volans n. sp. – Taiwan
wei Pace, 1993 (= *qingchengensis* Pace, 2012; n. syn.) – China: Fujian, Guizhou, Sichuan, Zhejiang
yongshengensis Pace, 2012 – China: Yunnan

Doubtful records:
condignus Last, 1969 – [Taiwan]; North India; Nepal
cylindricornis Dvořák, 1981 – [China: Liaoning]; Japan; Korea
hirtus (Kraatz, 1859) – [Taiwan]; Sri Lanka; South India
particornis (Sharp, 1888) – [China: Jilin]; Japan; Korea; Russian Far East

3.4 Key to the species of *Zyras* sensu strictu of China, Taiwan, and Hong Kong

The species described from the Burmese side of the Kambaiti pass at the border between Burma and the Chinese province Yunnan are included (in brackets) in the key below, even if they have not (yet) been recorded from China. It seems likely that they are present also on the Chinese side of the border. Doubtfully recorded species are omitted.

1 Body nearly uniformly reddish (Figs. 105, 166). Abdomen broader than elytra and sparsely punctate (Fig. 166). Posterior margin of tergite VII without palisade fringe. Antennomeres IV–VI at least weakly oblong (Fig. 30). Median lobe of aedeagus shaped as in Figs. 284–285. – Taiwan (Fig. 305). .. ***formosanus* n. sp.**
– Head, pronotum, elytra, or abdomen at least partly darker. Abdomen usually narrower than, or as broad as, elytra. Posterior margin of tergite VII with palisade fringe..... **2**
2 Pronotum reddish. **3**
– Pronotum reddish-brown to black, sometimes partly paler.... **11**
3 Elytra conspicuously short, 0.65 times as long as pronotum (Fig. 104). Abdominal segments III–VI pale-reddish (Fig. 161); meso- and metafemora distinctly bicoloured with the basal halves pale-yellowish and the apical halves infuscate. Rather small species: body length 5.8 mm; length of forebody 2.5 mm. Median lobe of aedeagus as figured by Pace (2012a). – Yunnan (Fig. 305)..... ***yongshengensis* Pace**
– Elytra longer, at least 0.7 times as long as pronotum. Abdominal segment VI of dark coloration (sometimes except for the margins) or body of much greater size. **4**
4 Apical antennomeres, at least antennomere XI, yellowish. **5**
– Apical antennomeres dark-reddish to black. **9**
5 Large and robust species; body length 7.5–9.5 mm; length of forebody 3.4–4.1 mm. Elytra extensively reddish at least in humeral portion. **6**
– Much smaller and more slender species; length of forebody < 3.2 mm. Elytra black, sometimes except for the suture.... **7**
6 Elytra with the postero-lateral angles extensively infuscate (Fig. 60), rarely uniformly reddish; apical 2–4 antennomeres yellowish (Fig. 3); abdominal tergite VI reddish (Fig. 117). Median lobe of aedeagus as in Figs. 180–181. – China: Sichuan; Vietnam (Fig. 304)..... ***alboantennatus* Pace**
– Elytra uniformly reddish (Fig. 58); apical 4 antennomeres yellowish (Fig. 4); abdominal tergite VI extensively infuscate (Fig. 114). Male unknown. – Burma..... [***setosipennis* Scheerpeltz]**
7 Apices of femora very narrowly and weakly infuscate (Fig. 99). Median lobe of aedeagus as in Figs. 274–277; apical lobe of paramere very short (Fig. 297). – South China; Taiwan; Hong Kong; India; Vietnam; Indonesia (Fig. 306).... ***hongkongensis* Pace**
– Apical halves of meso- and metafemora infuscate; profemora brown with the bases yellowish. Apical lobe of paramere much longer and more slender **8**
8 At least antennomeres VII–XI yellowish (Fig. 32). Median lobe of aedeagus as figured by Pace (1993). – Yunnan (Fig. 305)..... ***song* Pace**
– Only antennomere XI yellowish (Fig. 31). Median lobe of aedeagus as in Figs. 264–265. – Guangxi (Fig. 305). ..... ***exspoliatus* n. sp.**
9 Abdominal tergites III–IV reddish, sometimes with tergite IV more or less distinctly and more or less extensively brownish in the middle (Figs. 151–152); elytra blackish (rarely brown), sometimes with the suture narrowly reddish (Figs. 93–95). Antenna clavate, strongly incrassate apically; antennomeres IV–X distinctly transverse (Fig. 50). Median lobe of aedeagus as in Figs. 256–257. – Widespread in China, from Gansu to Beijing and Zhejiang. ..... ***beijingensis* Pace**

– Whole abdomen brown to black, sometimes with the posterior margins narrowly dark-reddish; elytra bicoloured: yellowish, with the postero-lateral portions more or less extensively blackish. Antenna slender or, if clavate, less strongly incrassate apically. **10**

10 Small species: body length 3.5–5.0 mm; length of forebody 1.7–2.2 mm. Antenna short (1.3–1.5 mm), distinctly incrassate apically; antennomeres IV–X distinctly transverse (Fig. 51). Eyes weakly convex, weakly protruding from lateral contours of head (Fig. 96). Pronotum larger in relation to head and distinctly broader, approximately 1.3 times as broad as head (Fig. 96). Dark spots in postero-lateral portions of elytra small (Fig. 96). Median lobe of aedeagus as in Figs. 258–259. – Min Shan (southern Gansu; northwestern Sichuan) (Fig. 305). ..... ***pulcher* n. sp.**

– Larger species: body length 6.8–8.5 mm; length of forebody 3.1–3.3 mm. Antenna much longer (2.5–2.6 mm) and more slender; antennomeres IV and V distinctly oblong (Fig. 28). Eyes large and bulging, strongly protruding from lateral contours of head (Fig. 90). Pronotum smaller in relation to head and narrower, approximately 1.15 times as broad as head (Fig. 90). Dark spots in postero-lateral portions of elytra extensive (Fig. 90). Median lobe of aedeagus as in Figs. 260–261. – Sichuan, Fujian (Fig. 306). ..... ***schuelkei* n. sp.**

11 Apical antennomeres, at least antennomere XI, pale-yellowish **12**

– Apical antennomeres reddish to black **15**

12 Large and robust species; width of pronotum > 1.3 mm. Abdominal tergites III–V reddish. Lateral margins of pronotum sinuate posteriorly in dorsal view **13**

– Distinctly smaller and more slender species; width of pronotum < 1.2 mm. At least abdominal tergite V largely infuscate **14**

13 Elytra uniformly dark-brown and with dense and uniform punctation everywhere (Fig. 57). Lateral margins of pronotum weakly sinuate near posterior angles (Fig. 57). Abdominal tergites VI and VII with non-setiferous punctation nearly everywhere (Fig. 113). Median lobe of aedeagus as in Figs. 178–179. – Jiangsu (Fig. 301). ..... ***chinkiangensis*** Bernhauer

– Elytra distinctly bicoloured with the anterior half yellowish and the posterior half infuscate (Fig. 56). Lateral margins of pronotum not sinuate near posterior angles (Fig. 56). Abdominal tergites VI and VII with non-setiferous punctation only near anterior margins (Fig. 112). Median lobe of aedeagus as in Figs. 176–177. – East Burma, North Vietnam (Fig. 301). ..... ***malaisei*** Scheerpeltz

14 Meso- and metafemora distinctly bicoloured, yellowish with the apex of the mesofemora and the apical $^1/_3$–$^2/_5$ of the metafemora blackish; apical 2–3 antennomeres yellowish (Fig. 29); pronotum blackish (Fig. 98); apical half of abdominal tergite VII yellowish (Fig. 155). On average larger and more slender species: body length 6.5–7.7 mm; length of forebody 3.0–3.1 mm. Antenna longer (2.4–2.6 mm) and more slender; antennomeres IV–VI longer than broad (Fig. 29). Aedeagus much larger and with very long ventral process of conspicuous shape (Figs. 266–267). – Yunnan (Fig. 304). ..... ***bisinuatus* n. sp.**

– Meso- and metafemora uniformly dark-yellowish; only antennomere XI yellowish (Fig. 53); pronotum dark-brown with the margins broadly dark-reddish (Fig. 53); anterior margin of tergite VII narrowly reddish (Fig. 153). On average smaller and less slender species: body length 5.3–7.0 mm; length of forebody 2.5–3.1 mm. Antenna shorter (1.8–2.0 mm) and less slender; antennomeres IV–V approximately as broad as long and VI–X transverse (Fig. 53). Aedeagus smaller and with much shorter and differently shaped ventral process (Figs. 270–271). – Yunnan (Fig. 305). ..... ***bicoloricollis* n. sp.**

15 Head distinctly wedge-shaped. Eyes very large, nearly reaching posterior margin of head. Pronotum with a pronounced large elevation posteriorly, along middle with conspicuously dense and distinctly granulose punctation. Male tergite III with a pronounced median projection posteriorly. Male tergite VII with dense and coarse granules in the middle. Male tergite VIII with dense oblong granules. Median lobe of aedeagus with pronounced crista apicalis (Pace 2010a: fig. 27). – Taiwan. ..... ***gibbus*** Pace

– Head not distinctly wedge-shaped. Pronotum and abdomen without such modifications. **16**

16 At least abdominal tergites III and IV reddish. **17**

– Abdominal tergites IV–VI brown to black, often except for the margins. For the variable *Z. songanus*, a small and slender species from Beijing with very dense non-setiferous punctation in the anterior impressions of tergites III–V, whose tergites III and IV may be red or infuscate, follow this alternative. **29**

17 Antennomere XI very short, much shorter than combined length of antennomeres IX and X, and of conical shape (Fig. 15). Abdominal sternites with dense and conspicuously long pubescence, in dorsal view distinctly projecting from lateral contours of abdomen. Forebody nearly uniformly brown (Fig. 101); abdomen reddish with the middle of tergite VI weakly infuscate (Fig. 156); metafemora weakly bicoloured with the basal half yellowish and the apical half brown. Median lobe of aedeagus as in Figs. 282–283. – Fujian (Fig. 302). ..... ***flexus* n. sp.**

– Antennomere XI longer, at least nearly as long as the combined length of IX and X, and not of distinctly conical shape. Abdominal sternites without dense and conspicuously long pubescence. Forebody and abdomen of different coloration; tergite VII at least partly infuscate; metafemora not bicoloured. **18**

18 Abdominal tergites III–VI reddish; tergites VII–IX predominantly dark-brown to black (except for the anterior portion of tergite VII and sometimes the posterior margins). **19**

– Abdomen of different coloration; tergite VI at least partly infuscate. **21**

19 Elytra uniformly dark-brown to blackish-brown (Fig. 91). Smaller (length of forebody 2.5–3.0 mm) and more slender species. Median lobe of aedeagus as in Figs. 262–263. – Fujian (Fig. 303). ..... ***discolor* n. sp.**

– Elytra bicoloured, with the anterior portion reddish-yellow to pale-reddish and the posterior portion blackish. Larger (length of forebody 2.8–3.6 mm) and more robust species. **20**

20 Elytra predominantly reddish-yellow to pale-reddish, with only the postero-lateral portions blackish (Fig. 69). Antenna completely blackish-brown to black and longer (Fig. 27). Pronotum with less sparse punctation, maximal width in anterior half, but closer to middle than to anterior angles (Fig. 69). Anterior impressions of abdominal tergites III–V with dense and fine non-setiferous punctation not arranged in a distinct row (Fig. 119). Posterior excision of tergite VIII more distinct (Fig. 119). Aedeagus larger, median lobe approximately 1.0 mm long (Figs. 234–235). – Yunnan, Sichuan, Jiangxi; Taiwan (Fig. 301). ..... ***nigrapicalis* n. sp.**

– Elytra blackish, with only the humeral portions yellowish (Fig. 172). Antennomere XI reddish, contrasting with antennomere X (Fig. 173). Pronotum with sparser punctation, maximal width close to anterior angles (Fig. 172). Anterior impressions of abdominal tergites III–V and anterior portion of VI each with a row of non-setiferous punctures (Fig. 174). Posterior margin of tergite VIII weakly concave in the middle (Fig. 175). Aedeagus smaller, median lobe 0.75 mm long (Figs. 231–233). – Yunnan (Fig. 302)..... ***atrapicalis* n. sp.**

21 Abdominal tergite VI with only the middle infuscate; tergite VII with the anterior two-thirds pale-reddish and the posterior third infuscate (Fig. 141). Pronotum weakly convex in cross-section and with irregularly spaced punctation (Fig. 83). Median lobe of aedeagus as in Figs. 221–222. – Hubei, Jiangxi (Fig. 305)..... ***maculicollis* n. sp.**

– Abdominal tergites VI and VII more extensively infuscate. **22**

22 Small species: body length 4.3–5.5 mm; length of forebody 1.9–2.1 mm. Antennomere XI approximately as long as the combined length of antennomeres VIII–X. Pronotum weakly transverse and small in relation to head, approximately 1.10–1.15 times as broad as long and only approximately 1.13–1.18 times as broad as head. **23**

– Larger species: length of forebody >2.3 mm. Antennomere XI shorter, approximately as long as the combined length of antennomeres IX–X. Pronotum in most species larger in relation to head. **24**

23 Eyes huge, nearly twice as long as postocular region in dorsal view (Fig. 97). Antennomere V approximately as broad as long (Fig. 43). Head and pronotum blackish (Fig. 97). Pronotum approximately 1.1 times as broad as long, 1.13 times as broad as head, weakly tapering posteriad, and strongly convex in cross-section (Fig. 97). Median lobe of aedeagus as in Figs. 272–273. – Hong Kong (Fig. 304). ..... ***fratrumkadooriorum*** Pace

– Eyes smaller, distinctly less than twice as long as postocular region in dorsal view (Fig. 169). Antennomere V distinctly transverse (Fig. 55). Head dark-brown; pronotum diffusely bicoloured, brown with the antero-lateral portion extensively paler yellowish-brown (Fig. 169). Pronotum 1.15 times as broad as long, 1.18 times as broad as head, strongly tapering posteriad, and weakly convex in cross-section (Fig. 169). Median lobe of aedeagus as in Figs. 227–228. – Taiwan..... ***volans* n. sp.**

24 Pronotum very slender, 1.05–1.10 times as broad as long (Fig. 170). Anterior impressions of tergites III–V with sparse, anterior portions of tergites VI–VII without non-setiferous punctation (Fig. 168). Ventral process of aedeagus weakly curved and apically blunt in lateral view (Figs. 229–230). – Taiwan. ..... ***hebes* n. sp.**

– Pronotum more transverse, >1.10 times as broad as long. Abdominal punctation pattern different and ventral process of aedeagus of different shape. – Unknown from Taiwan, except for *Z. tenuicornis*. **25**

25 Abdominal tergite VII distinctly bicoloured, with the anterior half reddish and the posterior half blackish; tergites III–IV reddish and V–VI infuscate (Fig. 138). Antenna less slender; antennomeres IV and V approximately as broad as long, VI–X of increasing width and increasingly transverse, X approximately 1.5 times as broad as long (Fig. 44). Median lobe of aedeagus as in Figs. 236–237. – Sichuan (Fig. 302)... ***seminigerrimus*** Bernhauer

– Abdominal tergite VII not distinctly bicoloured; tergites III–IV or III–V reddish. Antennae more slender; antennomeres IV and V at least weakly oblong, X distinctly less than 1.5 times as broad as long..... **26**

26 Abdominal tergites III–V reddish (Fig. 142). Antenna less slender; antennomeres IV and V weakly oblong (Fig. 26). Pronotum with moderately dense and nearly equally spaced punctation on either side of the impunctate midline (Fig. 84). Abdominal tergite VI with a transverse row of approximately ten non-setiferous punctures anteriorly (Fig. 142). Apical lobe of paramere short and stout, much less than half as long as basal portion. Median lobe of aedeagus as in Figs. 223–224. – Taiwan (Fig. 302). ..... ***tenuicornis* n. sp.**

– Abdominal tergites III–IV or III–V reddish. Antennae very long and slender; antennomeres IV and V more than 1.5 times as long as broad (e. g., Fig. 13). Pronotum largely impunctate, only with a cluster of punctures on either side of midline in posterior half and with sparse marginal punctures (Fig. 171). Abdominal tergite VI with or without very few non-setiferous punctures anteriorly. Apical lobe of paramere long and slender, at least half as long as basal portion. **27**

27 Male sternite VIII with convex posterior margin. Antennomere IX weakly transverse (Fig. 13). Median lobe of aedeagus as in Figs. 291–292. – Yunnan (Fig. 306). ... ***rectus* n. sp.**

– Male sternite VIII with truncate or even concave posterior margin (Fig. 288). Antennomere IX weakly oblong..... **28**

28 Abdominal tergites III and IV reddish, V dark-brown with reddish margins (Fig. 163). Antennae slightly more massive and with shorter and stouter antennomere I; antennomeres IV–VIII blackish-brown (Fig. 12). Median lobe of aedeagus as in Figs. 289–290. – Yunnan (Fig. 306)..... ***extensus* n. sp.**

– Abdominal tergites III–V reddish (Fig. 162). Antennae slightly less massive and with longer and more slender antennomere I; antennomeres IV–VIII reddish (Fig. 11). Median lobe of aedeagus as in Figs. 286–287. – Northeast Burma (Fig. 306). ..... [***glabricollis*** Scheerpeltz]

29 Abdominal tergites II–III and VIII uniformly reddish; tergites IV–V with reddish anterior and lateral margins and paratergites; tergites VI–VII with reddish anterior and antero-lateral portions (Fig. 131). Antennomeres IV–V oblong (Fig. 23). Pronotum relatively weakly transverse and only slightly broader than head (Fig. 75). Anterior impressions of tergites III–V and anterior portion of tergite VI with rather sparse non-setiferous punctation (Fig. 131). Median lobe of aedeagus as in Figs. 205–206. – Yunnan (Fig. 301)... ***bangmaicus* n. sp.**

– Abdominal tergite III at least partly infuscate; tergites IV–VI darker. (For *Z. hauserianus*, which has tergite III very weakly infuscate, tergite II more distinctly infuscate, distinctly transverse antennomeres IV–X, and anterior impressions of tergites III–V with very dense non-setiferous punctation, follow this alternative.) **30**

30 Abdomen distinctly bicoloured, blackish with segments VII and VIII reddish. **31**

– Abdomen blackish, often with the margins of the segments reddish. **33**

31 Elytra distinctly bicoloured, dark-yellowish with the postero-lateral portions extensively blackish (Fig. 61). Median lobe of aedeagus as in Figs. 186–187. – Hubei, Sichuan (Fig. 301). ..... ***rufoterminalis* n. sp.**

– Elytra blackish..... **32**

32 Legs yellowish; antenna blackish (Fig. 5). Pronotum with very sparse and irregularly spaced punctation (Fig. 59). Posterior margins of abdominal tergites III–VI with very

few punctures (Fig. 115). Median lobe of aedeagus as in Figs. 182–183. – Yunnan; Burma (Fig. 302). ***kambaitiensis*** Scheerpeltz

– Legs with blackish femora and dark-brown tibiae; antennae reddish-brown to brown, with blackish-brown antennomere I (Fig. 6). Pronotum, except for the sparsely punctate posterior portion, with moderately dense and nearly regularly spaced punctation on either side of the impunctate midline (Fig. 62). Posterior margins of abdominal tergites III–VI with numerous fine punctures (Fig. 116). Median lobe of aedeagus as in Figs. 184–185. – Taiwan (Fig. 301). ***rufapicalis*** **n. sp.**

33 Elytra uniformly blackish. **34**

– Elytra bicoloured or uniformly yellowish. **39**

34 Legs yellowish. **35**

– Legs with at least the femora brown to blackish. **36**

35 Antenna much longer and more massive; antennomeres IV–X weakly transverse at most (Fig. 8). Punctation of pronotum and elytra rather dense and nearly equally spaced (Fig. 63). Anterior portions of abdominal tergites III–VI usually without non-setiferous punctation (Fig. 120). Median lobe of aedeagus as in Figs. 238–241. – Widespread in China, from Sichuan to Qinghai and Hubei (Fig. 303). ***nigricornis*** **n. sp.**

– Antenna much shorter and less massive; antennomeres IV–X distinctly transverse (Fig. 49). Punctation of pronotum sparse and irregularly spaced, that of elytra sparse in posterior portion (Fig. 87). Anterior portions of abdominal tergites III–VI with non-setiferous punctation (Fig. 145). Median lobe of aedeagus as in Figs. 254–255. – Yunnan (Fig. 303). ***nigronitens*** **n. sp.**

36 Pronotum and elytra with sparse and fine punctation; interstices on average distinctly broader than diameter of punctures (Fig. 89). Antenna blackish-brown with antennomere XI reddish (Fig. 48). Median lobe of aedeagus as in Figs. 248–249. – Tibet (Fig. 303). ***atronitens*** **n. sp.**

– Pronotum and elytra with denser and coarser punctation. Antennomere XI blackish-brown to black. **37**

37 Coloration paler; femora brown, tibiae yellowish to yellowish-brown; elytra brown (Fig. 88); antennae dark-brown with slightly paler basal antennomeres (Fig. 47). Median lobe of aedeagus as in Figs. 252–253. – Sichuan (Fig. 305). ***athetoides*** **n. sp.**

– Femora and tibiae blackish; elytra black; antennae blackish. **38**

38 Antenna conspicuously massive; antennomere III stout and conical, barely 1.5 times as long as broad (Fig. 46). Median lobe of aedeagus as in Figs. 250–251. – Sichuan, Yunnan (Fig. 304). ***tumidicornis*** **n. sp.**

– Antenna much less massive; antennomere III slender and approximately twice as long as broad (Fig. 45). Median lobe of aedeagus as in Figs. 242–247. – Sichuan, Tibet (Fig. 304). ***tenebricosus*** **n. sp.**

39 Antennomere IV distinctly transverse, at least approximately 1.3 times as broad as long. For the variable *Z. songanus*, a small and slender species from Beijing with very dense non-setiferous punctation in the anterior impressions of tergites III–V, whose antennomere IV is somewhat intermediate, follow this alternative. **40**

– Antennomere IV oblong, as long as broad, or very weakly transverse **45**

40 Antenna strongly incrassate and with strongly transverse antennomeres IV–X; antennomeres VI–VIII approximately twice as broad as long, or nearly so (Fig. 42). Rather small (length of forebody 2.4–2.5 mm), glossy, and sparsely punctate species (Figs. 80, 136). Median lobe of aedeagus rather small, only approximately 0.65 mm long (Figs. 119–120). – Qinghai (Fig. 302). ***dabanicus*** **n. sp.**

– Antenna less strongly incrassate and with less strongly transverse antennomeres IV–X; antennomeres VI–VIII less than twice as broad as long. **41**

41 Antenna massive, but only very weakly incrassate apically; antennomere V nearly as broad as antennomere X (Fig. 20). Elytra with small dark spots in postero-lateral portion (Fig. 67). Median lobe of aedeagus as in Figs. 195–196. – Fujian (Fig. 301). ***firmicornis*** **n. sp.**

– Antenna less massive and more strongly incrassate; antennomere V distinctly less broad than antennomere X. **42**

42 Anterior impressions of abdominal tergites III–V and anterior portions of tergites VI–VII with very dense non-setiferous punctation. **43**

– Anterior impressions of abdominal tergites III–V and anterior portions of tergites VI–VII with sparse non-setiferous punctation. **44**

43 Antennomere IV more transverse, approximately 1.5 times as broad as long (Fig. 38). Pronotum broader, approximately 1.2 times as broad as long, and less convex in cross-section (Fig. 77). – Xinjiang. ***hauserianus*** Bernhauer

– Antennomere IV distinctly less than 1.5 times as broad as long (Fig. 54). Pronotum more slender, 1.10–1.15 times as broad as long, and more convex in cross-section (Fig. 111). – Beijing. ***songanus*** Pace

44 Antenna longer and more massive; antennomere X barely 1.5 times as broad as long (Figs. 14, 22). Elytra yellowish, with or without a small, weakly defined, and weakly infuscate spot in or near postero-lateral angles (Figs. 74, 110). Posterior half of abdominal tergite VII very sparsely punctate (Figs. 130, 140). Posterior margin of tergite VIII distinctly concave in the middle. Median lobe of aedeagus more slender in ventral view, with more slender ventral process in lateral view, and with the crista apicalis more oblique and distinctly separated from base of ventral process (lateral view) (Figs. 199–200, 209–210). – China: Beijing (Fig. 304); Russia: East Siberia; North Korea; Japan. ***sibiricus*** Bernhauer

– Antenna shorter and less massive; antennomere X nearly twice as broad as long (Fig. 37). Elytra with extensively infuscate postero-lateral angles (Fig. 76). Posterior half of abdominal tergite VII more densely punctate (Fig. 133). Posterior margin of tergite VIII with or without very indistinct median concavity. Median lobe of aedeagus broader in ventral view, with stouter ventral process in lateral view, and with the crista apicalis less oblique and not distinctly separated from base of ventral process (lateral view) (Figs. 207–208). – China: Qinghai, Gansu; Russia: East Siberia, Far East. ***inexcisus*** **n. sp.**

45 Anterior impressions of abdominal tergites III–V and anterior portion of tergite VI practically without non-setiferous punctation, with few scattered punctures at most. **46**

– Anterior impressions of abdominal tergites III–V and anterior portion of tergite VI with more or less dense, though often fine, non-setiferous punctation. **48**

46 Species of broad habitus. Pronotum large and rather strongly transverse, approximately 1.25 times as broad as long and 1.4 times as broad as head (Fig. 79). Antennomere XI slightly longer than the combined length of antennomeres IX and X (Fig. 40). Abdomen approximately as broad as elytra (Fig. 135). Median lobe of aedeagus as in Figs. 213–214. – Yunnan (Fig. 301). ***lativentris*** **n. sp.**

– More slender species. Pronotum relatively smaller and less strongly transverse. Antennomere XI not longer than the combined length of antennomeres IX and X. Abdomen at least slightly narrower than elytra. **47**

47 Posterior halves of male abdominal tergites VII and VIII with coarsely granulose punctation (Fig. 134). Antenna less massive (Fig. 39). Median lobe of aedeagus as in Figs. 211–212. – Sichuan (Fig. 301). ..... ***granapicalis* n. sp.**

– Posterior halves of male abdominal tergites VII and VIII with fine and non-granulose punctation (Fig. 124). Antenna more massive (Fig. 17). Median lobe of aedeagus as in Figs. 188–189. – China: Yunnan; Burma (Fig. 303). ..... ***birmanus*** Scheerpeltz

48 Pronotum and elytra with coarse and not very dense punctation (Fig. 81). Maxillary palpi dark-brown (Fig. 81). Non-setiferous punctation of anterior impressions of tergites III–V rather coarse (Fig. 137). Median lobe of aedeagus as in Figs. 225–226. – China: Guangxi, Zhejiang; Hong Kong (Fig. 302). ..... ***notaticornis*** Pace

– Pronotum and elytra with distinctly denser and much finer punctation. Maxillary palpi yellowish. Non-setiferous punctation of anterior impressions of tergites III–V fine..... **49**

49 Posterior halves of abdominal tergites III–IV only with a median pair of punctures and a lateral puncture on either side, and with 2–6 setiferous punctures at posterior margin. Postero-lateral portions of elytra usually more extensively infuscate. **50**

– Posterior halves of abdominal tergites III–IV with several punctures in addition to the median pair of punctures and the lateral puncture on either side, and with more numerous setiferous punctures at the posterior margins. Postero-lateral portions of elytra usually with small, sometimes nearly obsolete, dark spot..... **52**

50 Larger species (length of forebody 3.2–3.5 mm). Antenna longer (2.5–2.7 mm) and more massive; antennomeres IV–VII as long as broad or even oblong, and VIII–X very weakly transverse (Fig. 7). Anterior impressions of abdominal tergites III–V with denser and more distinct non-setiferous punctation (Fig. 69). Median lobe of aedeagus more robust, larger (approximately 1.0 mm), and with relatively shorter ventral process (Figs. 217–218). – Yunnan (Fig. 303). ..... ***gilvipalpis* n. sp.**

– Slightly smaller species with shorter (2.0–2.4 mm) and less massive antennae; at least antennomeres VI–X distinctly transverse. Anterior impressions of abdominal tergites III–V with sparse and fine non-setiferous punctation. Median lobe of aedeagus more slender, slightly smaller (0.85–0.95 mm), and with relatively longer ventral process. **51**

51 Antenna more distinctly incrassate; antennomeres VI–X distinctly transverse, at least approximately 1.5 times as broad as long (Fig. 41). Elytra with sparser and coarser punctation (Fig. 71). Median lobe of aedeagus with much more slender ventral process, particularly in ventral view (Figs. 215–216). – Yunnan (Fig. 302). ..... ***caloderoides* n. sp.**

– Antenna weakly incrassate; antennomeres VI–X weakly transverse, distinctly less than 1.5 times as broad as long (Fig. 18). Elytra with denser and finer punctation (Fig. 65). Ventral process of aedeagus broader in ventral view and stouter in lateral view (Figs. 190–192). – Widespread in China, from the Daba Shan and Qinling Shan to Sichuan; female-based records also from Yunnan (Fig. 302). ..... ***shaanxiensis*** Pace

52 Pronotum more convex in cross-section and more slender, approximately 1.3 times as broad as head (Fig. 73). Punctation of pronotum and elytra less dense (Fig. 73). Ventral process of aedeagus apically shorter in ventral view and more slender in lateral view; crista apicalis more oblique (Figs. 97–98). – Sichuan (Fig. 301). ..... ***subobsoletus* n. sp.**

– Pronotum less convex in cross-section and less slender, 1.35–1.40 times as broad as head (Fig. 66). Punctation of pronotum and elytra dense (Fig. 66). Ventral process of aedeagus apically longer in ventral view and less slender in lateral view; crista apicalis less oblique (Figs. 193–194). – Widespread in China: Fujian, Guizhou, Sichuan, Zhejiang (Fig. 306)..... ***wei*** Pace

3.5 The species of China, Taiwan, and Hong Kong, including the border region with Burma

Zyras (Zyras) malaisei Scheerpeltz, 1965 (Figs. 1, 56, 112, 176–177, 201–202, 301)

Zyras (Zyras) malaisei Scheerpeltz, 1965: 345 ff.

Type material examined

Paratypes: 1 ♀: "♀ / N. E. Burma, Kambaiti 7000 ft., 25–27/4 1934, R. Malaise / Schwedische Indien-Burma Expedition 1934 / ex coll. Scheerpeltz / Allotypus / Typus *Zyras Malaisei* O. Scheerpeltz / Malaisei Schp. / *Zyras malaisei* Scheerpeltz, det. V. Assing 2015" (NHMW); 1 ♂: same data, but "19/4 1934 … Cotypus *Zyras Malaisei* O. Scheerpeltz" (NHMW); 1 ♂ [slightly teneral]: same data, but "23/5-34" (NHMW).

Comment

The original description is based on a male holotype and five paratypes from "N. E. Burma, Kambaiti" (Scheerpeltz 1965). The type material is deposited in SMNH and NHMW.

Redescription

Rather large species; body length 7.5–9.0 mm; length of forebody 3.6–3.9 mm. Coloration: head and pronotum black; elytra reddish-yellow to reddish, with the posterior portion extensively blackish (Fig. 56); abdomen (Fig. 112) with segments III–IV reddish to dark-reddish, V reddish to blackish-brown with reddish anterior and lateral margins, VI–VII blackish, and VIII–X yellowish; legs yellowish to dark-reddish; antennae (Fig. 1) blackish with the apical 2–3 antennomeres pale-yellowish and sometimes with the basal antennomeres reddish-brown; maxillary palpi blackish with the terminal palpomere reddish.

Head (Fig. 56) distinctly transverse, broadly impunctate along middle; punctation in lateral dorsal portions rather coarse and moderately sparse. Eyes noticeably longer than postocular region in dorsal view. Antenna (Fig. 1) approximately 3 mm long and rather slender; antennomeres IV–V weakly oblong; VI–VII approximately as broad as long; VIII–X weakly transverse; XI approximately as long as the combined length of IX and X.

Pronotum (Fig. 56) 1.10–1.15 times as broad as long and 1.30–1.33 times as broad as head, posteriorly with a pronounced median impression; punctation of variable density, but generally sparse, irregularly spaced, and of variable size and depth (though generally coarse); midline narrowly impunctate; lateral margins with few long black setae anteriorly and posteriorly.

Elytra (Fig. 56) approximately 0.85 times as long as pronotum; punctation coarse, dense and somewhat asperate in lateral and anterior portions, sparser in posterior portions and near suture. Hind wings fully developed. Metatarsomere I approximately as long as the combined length of II–IV.

Abdomen (Fig. 112) slightly narrower than elytra, with rather shallow anterior impressions on tergites III–V; anterior impressions of tergites III–V and anterior portions of tergites VI–VII with distinct and dense non-setiferous punctation; tergite III with a pair of median punctures, a lateral puncture, and a lateral marginal puncture on either side, otherwise impunctate; tergites IV–V each with a lateral puncture on either side and with four marginal punctures; tergite VI with a lateral puncture on either side and with six marginal punctures posteriorly; tergite VII with sparse punctation arranged in two irregular rows; tergite VIII with moderately dense punctation in posterior portion; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe.

♂: tergite VIII transverse, posterior margin with distinct median concavity and with a convex lateral projection on either side (Fig. 201); sternite VIII somewhat longer than tergite VIII and convex posteriorly (Fig. 202); median lobe of aedeagus approximately 1.0 mm long and shaped as in Figs. 176–177.

♀: posterior margin of tergite VIII concave in the middle.

Comparative notes

Zyras malaisei is characterized by the combination of relatively large body size, relatively slender antennae with the apical two to three antennomeres pale-yellowish, irregularly spaced punctation of the pronotum, distinctly bicoloured elytra, yellowish apex of the abdomen, a modified and sexually dimorphic posterior margin of tergite VIII, and by the shape of the median lobe of the aedeagus.

Distribution and natural history

Zyras malaisei is currently known only from the type locality at the Burmese side of the border between Burma and the Chinese province Yunnan, and from one locality in North Vietnam (Assing 2015d) (Fig. 301), suggesting that the species is widespread and present also in China. The type specimens were collected at an altitude of approximately 2100 m, the additional specimen was sifted from litter of bushes and trees near a forest margin at an altitude of 2030 m. One of the examined paratypes is slightly teneral.

Zyras (Zyras) chinkiangensis Bernhauer, 1939
(Figs. 2, 57, 178–179, 113, 301)

Zyras (Zyras) chinkiangensis Bernhauer, 1939: 148 f.

Type material examined

Lectotypus ♂ [dissected prior to present study; in rather poor condition; right elytron and right antenna missing], present designation: "Nordwestl. [sic] China / Chinkiang, Col. Reitter / chinkiangensis Bernh. Typus. *Zyras* / *chinkiangensis* Brnh. Typ. / Chicago NHMus, M. Bernhauer Collection / *Zyras chinkiangensis* / *Zyras chinkiangensis* Ber., det. R. Pace 1984, Holotypus / Lectotypus ♂ *Zyras chinkiangensis* Bernhauer, desig. V. Assing 2015 / *Zyras chinkiangensis* Bernhauer, det. V. Assing 2015" (FMNH).

Comment

The original description is based on an unspecified number of syntypes from "Nordwestl. China: Chinkiang", today Zhenjiang in Jiangsu province, East China (Bernhauer 1939). The sole type specimen in the Bernhauer collection, a male with only one elytron and one antenna, is designated as the lectotype. It had been mis-sexed as a female ("♂ unbekannt") by Bernhauer (1939). As can be inferred from the identification label, it had been examined and dissected by R. Pace. The abdominal sternites have the pubescence long and erect, but this may be an artefact previously observed also in many other aleocharines dissected and processed by R. Pace. For remarks on the possible synonymy with *Z. setosipennis* see the comment in the section on that species.

Redescription

Rather large species; body length 7.3 mm; length of forebody 3.7 mm. Coloration: head blackish; pronotum blackish-brown; elytra brown; abdomen (Fig. 113) with tergites I–V reddish, VI–VII blackish with the anterior margins reddish, and VIII brown (Fig. 57); legs yellowish with the bases of the meso- and metatibiae slightly darker, the profemora dark-brown, and the protibiae brown; antennae (Fig. 2) blackish, with antennomeres IX–XI pale-yellowish; maxillary palpi dark-brown with palpomere IV yellowish.

Head (Fig. 57) distinctly transverse, broadly impunctate along middle; punctation in lateral dorsal portions rather fine and moderately sparse. Eyes strongly bulging and much longer than postocular region in dorsal view. Antenna (Fig. 2) approximately 3 mm long and slender; antennomere IV distinctly oblong, approximately 1.5 times as long as broad; antennomeres V–VII weakly oblong, VIII approximately as broad as long, and IX–X weakly transverse; XI approximately as long as the combined length of IX and X.

Pronotum (Fig. 57) 1.2 times as broad as long and 1.26 times as broad as head; lateral margins sinuate poste-

riorly in dorsal view; anterior angles and lateral margins with numerous long and erect brown setae; punctation rather dense, fine, and nearly regularly spaced.

Elytra long, approximately 0.95 times as long as pronotum; punctation dense and moderately coarse. Hind wings fully developed. Metatarsomere I approximately as long as the combined length of II–IV.

Abdomen (Fig. 113) broad, with deep anterior impressions on tergites III–V; anterior impressions of tergites III–V with rather fine non-setiferous punctures; tergite III with several lateral punctures on either side and with approximately eight punctures at posterior margin; tergite IV with several lateral punctures on either side and with approximately ten punctures at posterior margin; tergite V with a median pair of punctures, with several lateral punctures on either side and with more than ten punctures at posterior margin; tergite VI anteriorly with non-setiferous punctation on whole disc except near posterior margin, this punctation dense in anterior portion and sparser in median portion, posterior margin with approximately twelve setiferous punctures; tergite VII with non-setiferous punctation in anterior half and with setiferous punctures arranged in two irregular transverse series in posterior portion; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe; posterior margin of tergite VIII weakly concave in the middle.

♂: sternite VIII broadly convex; median lobe of aedeagus approximately 1.0 mm long and shaped as in Figs. 178–179; apical lobe of paramere very short.

♀: unknown.

Comparative notes

Zyras chinkiangensis is characterized particularly by its coloration, rather large size, the sinuate lateral margins of the pronotum, the punctation pattern of the abdomen, and the shape of the median lobe of the aedeagus.

Distribution and natural history

This species is currently known only from Zhenjiang, Jiangsu, East China (Fig. 301). Additional data are not available.

Zyras (Zyras) alboantennatus Pace, 1986
(Figs. 3, 60, 117, 180–181, 304)

Zyras (Zyras) alboantennatus Pace, 1986a: 460.
Zyras (Zyras) sichuanorum Pace, 2012a: 85 f.; **n. syn.**

Type material examined

Z. alboantennatus: Holotype ♂: "Burma, Anisakan [21°57′N, 96°25′E], 12.I.1981, de Rougemont / Holotypus *Zyras* (s. str.) *alboantennatus* mihi, det. R. Pace 1982 / *Zyras alboantennatus* n. sp., det. R. Pace 1983" (MCSNV).

Z. sichuanorum: Holotype ♂: "China, Sichuan, Qingcheng Shan, 65 km NW Chengdu, 103.33 E, 30.53 N, 18.V/3.–4.VI.1997, 8 km W Taiping, 800–1000 m, leg. A. Pütz / Holotypus *Zyras sichuanorum* mihi, det. R. Pace 2009 / *Zyras sichuanorum* n. sp., det. R. Pace 2009" (cPüt). – Paratypes: 2 ♀♀: "China: Prov. Sichuan, Wenjian Distr., Guanxian Co., 65 km NW Chengdu, Qingcheng Shan, 975 m, 30.53.84N, 103.32.80E, 18.VI.1999, leg. A. Pütz" (cPüt).

Additional material examined

China: 1 ♂, Sichuan, Ya'an Pref., Shimian Co., Daxue Shan, road between Anshunchang and Wanba, ca. 20 km WSW Shimian, ca. 1500 m, 9.VII.1999, leg. Wrase (cAss); 1 ♀, Sichuan, Moxi env., Hailuogou valley, Gonghe, 29°37′N, 102°06′E, 1715 m, fallows near margin of mixed forest, at light, 17.–21.VI.2014, leg. Hájek et al. (NMP).

Comment

The original description of *Z. alboantennatus* is based on a single male from "Burma, Anisakan" (Pace 1986a), that of *Z. sichuanorum* on a male holotype and two female paratypes collected in two localities in the Qingcheng Shan, Sichuan (Pace 2012a). An examination of the type material of both names revealed that, regarding their external characters, the specimens are all within the range of intraspecific variation of one and the same species and that the male primary sexual characters are identical. Hence the synonymy proposed above.

Redescription

Large species; body length 8.0–9.5 mm; length of forebody 3.4–4.1 mm. Coloration: head black; pronotum bright-reddish; elytra reddish with the postero-lateral portions more or less extensively triangularly infuscate (Fig. 60), rarely uniformly reddish; abdomen (Fig. 117) bright-reddish, with the middle of tergites VII and VIII, mostly also of tergite VI, more or less extensively infuscate, sometimes leaving only the margins reddish; legs yellowish, with the profemora and protibiae brownish; maxillary palpi dark-brown, with the terminal joint yellowish; antennae (Fig. 3) blackish-brown, with antennomeres VIII–XI, IX–XI, or X–XI pale-yellowish.

Head (Fig. 60) moderately transverse, broadly impunctate in median portion, in lateral portions with rather sparse and fine punctation; interstices broader than diameter of punctures. Eyes strongly bulging, distinctly longer than postocular region in dorsal view. Antenna (Fig. 3) slender, 2.6–2.9 mm long; antennomeres IV distinctly, V–VI weakly oblong; VII–VIII approximately as long as broad; IX–X weakly transverse; XI slightly shorter than the combined length of IX and X.

Pronotum (Fig. 60) 1.15–1.20 times as broad as long and approximately 1.25 times as broad as head; punctation fine, moderately dense, and very shallow; interstices on average broader than diameter of punctures; midline impunctate only in the middle; pubescence long, yellowish, sparse, and suberect.

Elytra (Fig. 60) approximately 0.9 times as long as pronotum; punctation defined, much more so than that of pronotum, moderately fine, and rather dense. Hind wings fully developed. Metatarsomere I approximately as long as the combined length of II–IV.

Abdomen (Fig. 117) large, nearly as broad as elytra, with moderately deep anterior impressions on tergites III–V; tergites III–V each with a row of rather dense nonsetiferous punctures in anterior impressions, with some setiferous punctures bearing long black setae in lateral portions, with a median pair of punctures, and with scattered fine punctures on discs; tergite VI with rather dense punctation in anterior half, some setiferous punctures laterally, scattered fine punctures in posterior half, and with a row of coarser punctures at posterior margin; tergite VII with dense and fine punctation in anterior half, and with coarser and less dense punctation in posterior half; tergite VIII with moderately dense punctation only in posterior portion; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe; posterior margin of tergite VIII shallowly concave in the middle.

♂: sternite VIII with strongly convex posterior margin; median lobe of aedeagus approximately 1.1 mm long and shaped as in Figs. 180–181.

♀: general outline of posterior margin of sternite VIII broadly and weakly convex, in the middle with pronounced concavity.

Comparative notes

This species is characterized particularly by its large size, the conspicuous coloration, the fine punctation of the pronotum, the punctation pattern of the abdomen, and by the shape of the median lobe of the aedeagus. For characters distinguishing it from the similar *Z. setosipennis* see the comparative notes in the section on that species.

Distribution and natural history

Based on examined material, the known distribution includes four localities in Sichuan (Fig. 304), one in Burma, and one in Vietnam (Assing 2015d). Pace (2012a) recorded the species from the environs of Lijiang, Yunnan.

The non-type male was collected on a stream bank, the female with a light trap placed in fallows near the margin of a mixed forest. The altitudes range from approximately 360 to 1715 m.

Zyras (Zyras) kambaitiensis Scheerpeltz, 1965
(Figs. 5, 59, 115, 182–183, 203–204, 302)

Zyras (Zyras) kambaitiensis Scheerpeltz, 1965: 347 f.
Zyras (Zyras) ferrugineiventris Scheerpeltz, 1965: 349 f.; **n. syn.**
Zyras (Zyras) semiasperatus Scheerpeltz, 1965: 353 f.; **n. syn.**

Type material examined

Z. kambaitiensis: Paratypes: 1 ♀: "♀ / N. E. Burma, Kambaiti 7000 ft., 22/4 1934, R. Malaise / Schwedische Indien-Burma Expedition 1934 / ex coll. Scheerpeltz / Allotypus / Typus *Zyras kambaitiensis* O. Scheerpeltz / *kambaitiensis* Schp. / *Zyras kambaitiensis* Scheerpeltz, det. V. Assing 2015" (NHMW); 1 ex.: same data, but "13/5 1934 … Cotypus *Zyras kambaitiensis* O. Scheerpeltz" (NHMW); 2 exs.: same data, but "28/5.1934, 2000 m" (NHMW); 2 exs.: same data, but "12/5.1934" (NHMW).

Z. ferrugineiventris: Holotype ♀: "♀ / N. E. Burma, Kambaiti 7000 ft., 19/4 1934, R. Malaise / Holotypus / Typus *Zyras ferrugineiventris* O. Scheerpeltz / *Zyras (Zyras) ferrugineiventris* n. sp., det. Scheerpeltz 1941 / 3736, E91 + / NHRS-JLKB 000023265 / *Zyras kambaitiensis* Scheerpeltz, det. V. Assing 2015" (SMNH).

Z. semiasperatus: Paratypes: 1 ♀: "♀ / N. E. Burma, Kambaiti 7000 ft., 13/5 1934, R. Malaise / Schwedische Indien-Burma Expedition 1934 / ex coll. Scheerpeltz / Allotypus / Typus *Zyras semiasperatus* O. Scheerpeltz / *semiasperatus* Schp. / *Zyras kambaitiensis* Scheerpeltz, det. V. Assing 2015" (NHMW); 1 ex.: same data, but "12/5 1934 … Cotypus *Zyras semiasperatus* O. Scheerpeltz / *Zyras kambaitiensis* Scheerpeltz, det. V. Assing 2015" (NHMW); 1 ex.: same data, but "1/5 1934" (NHMW).

Additional material examined

China: 1 ♂, Yunnan, Nujiang Lisu Aut. Pref., Gaoligong Shan, pass 21 km NW Liuku, 25°58′N, 98°41′E, 3150 m, under stones along road, 9.VI.2007, leg. Wrase (cAss).

Comment

The type localities of *Z. kambaitiensis*, *Z. ferrugineiventris*, and *Z. semiasperatus* are identical ("N. E. Burma, Kambaiti"). The original description of *Z. kambaitiensis* is based on 17 type specimens, that of *Z. ferrugineiventris* on a single female, and that of *Z. semiasperatus* on seven type specimens (Scheerpeltz 1965). The lengthy descriptions of *Z. ferrugineiventris* and *Z. semiasperatus* do not emphasize any characters distinguishing these species from *Z. kambaitiensis*. The examined type material of *Z. ferrugineiventris* and *Z. semiasperatus* is more or less distinctly teneral, but otherwise (including the male sexual characters) identical to that of *Z. kambaitiensis*, indicating that all three names are synonymous. They were made available in the same article; *Zyras kambaitiensis* is designated as the senior name.

Redescription

Body length 6.5–8.0 mm; length of forebody 3.5–4.2 mm. Coloration: body blackish-brown to black (Figs. 59–115), with the abdominal apex (segments VII–X) reddish and occasionally the abdominal segments III or III–IV slightly paler; legs yellowish; antennae (Fig. 5) blackish, sometimes with the basal two antennomeres slightly paler; maxillary palpi yellowish to yellowish-brown.

Head (Fig. 59) distinctly transverse, broadly impunctate along middle; punctation in lateral dorsal portions

rather fine and sparse. Eyes noticeably longer than postocular region in dorsal view. Antenna (Fig. 5) 2.6–3.0 mm long and rather slender; antennomeres IV–V weakly oblong or as long as broad; VI–X weakly transverse; XI slightly shorter than the combined length of IX and X.

Pronotum (Fig. 59) relatively weakly transverse, 1.08–1.12 times as broad as long and 1.30–1.35 times as broad as head, posteriorly with a pronounced median impression; punctation of variable density, moderately sparse, irregularly spaced, and of variable size and depth (mostly moderately coarse); midline narrowly impunctate.

Elytra (Fig. 59) 0.80–0.85 times as long as pronotum; punctation moderately coarse, dense and somewhat asperate in lateral and anterior portions, sparser in posterior portions and near suture. Hind wings fully developed. Metatarsomere I approximately as long as the combined length of II–IV.

Abdomen (Fig. 115) slightly narrower than elytra, with moderately deep anterior impressions on tergites III–V; anterior impressions of tergites III–V and anterior portions of tergites VI–VII with very sparse non-setiferous punctation, nearly impunctate; tergites III–V with a lateral puncture on either side and with four punctures at posterior margin, otherwise impunctate; tergite VI with a lateral puncture on either side and with six punctures at posterior margin; tergite VII in posterior portion with two transverse rows composed of only about four punctures each; tergite VIII with few setiferous punctures in posterior portion; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe.

♂: tergite VIII (Fig. 203) transverse, middle of posterior margin with a pair of tooth-like projections, between these projections concave; sternite VIII (Fig. 204) longer than tergite VIII, approximately as long as broad, and convex posteriorly; median lobe of aedeagus 1.0–1.1 mm long and shaped as in Figs. 182–183.

♀: posterior margin of tergite VIII concave in the middle.

Comparative notes

Zyras kambaitiensis is characterized particularly by the coloration of the body, the punctation pattern of the abdomen, the modifications of the sexually dimorphic tergite VIII, and by the shape of the aedeagus. It is distinguished from the syntopic and sympatric *Z. malaisei* by the less coarse punctation of the head and pronotum, the different coloration of the antennae, the elytra, the abdomen, and the maxillary palpi, the nearly impunctate anterior portions of the abdominal tergites III–VII, the different modifications of the male tergite VIII, and the differently shaped median lobe of the aedeagus. From the similarly coloured *Z. kraatzi*, *Z. kambaitiensis* differs by larger body size, distinctly longer and more massive antennae, a more transverse and less convex (cross-section) pronotum with denser and coarser punctation, much denser, coarser, and partly granulose punctation of the elytra, and a larger median lobe of the aedeagus with a more slender (lateral view) apical portion of the ventral process.

Distribution and natural history

Zyras kambaitiensis is currently known from two localities, one in northeastern Burma, close to the border with Yunnan, and one in the Gaoligong Shan, western Yunnan, China, from where the species is reported for the first time (Fig. 302). The partly teneral type specimens were collected at an altitude of approximately 2100 m, the additional specimens from under a stone on a road margin at an altitude of 3150 m.

Zyras (Zyras) rufapicalis **n. sp.**
(Figs. 6, 62, 116, 184–185, 301)

Zyras wei: Pace (2010a); misidentification.

Type material

Holotype ♂: "Taiwan, Kaohsiung Hsien, Peinantashan trail 2450 m, 2.V.1995 A. Smetana [T170] / *Zyras wei* Pace, det. R. Pace 2006 / Holotypus ♂ *Zyras rufapicalis* sp. n. det. V. Assing 2014" (cSme).

Paratypes: 1 ♀: same data as holotype (cSme); 2 ♂♂: "Taiwan, Nantou Hsien, Nenkaoshan ridge, 2850 m, 7.V.1992, A. Smetana [T118]" (cSme, cAss).

Etymology

The specific epithet is composed of the Latin adjectives rufus (red) and apicalis (apical). It alludes to the conspicuously reddish apex of the abdomen.

Description

Large species; body length 8.5–9.5 mm; length of forebody 3.8–4.0 mm. Coloration: body (Figs. 62, 116) black and shiny, with the abdominal apex (segments VIII–X and posterior half of VII) reddish; legs with the femora blackish, the tibiae brownish, and the tarsi reddish; maxillary palpi yellowish-red to reddish-brown; antennae (Fig. 6) reddish-brown to brown, with blackish-brown antennomere I.

Head (Fig. 62) distinctly transverse, broadly impunctate along middle; punctation in lateral dorsal portions sparse; interstices distinctly broader than diameter of punctures. Eyes distinctly longer than postocular region in dorsal view. Antenna (Fig. 6) 2.7–2.8 mm long, moderately massive; antennomere IV approximately as long as broad; V–VI as long as broad or weakly transverse; VII–X gradually and weakly increasing in width; X weakly transverse, much less than 1.5 times as broad as long; XI shorter than the combined length of IX and X.

Pronotum (Fig. 62) 1.14–1.20 times as broad as long and 1.34–1.38 times as broad as head; punctation moderately

sparse; interstices on average broader than diameter of punctures; midline narrowly impunctate; lateral margins and antero-lateral portion with some long black setae.

Elytra (Fig. 62) 0.85–0.90 times as long as pronotum; punctation defined and moderately dense (denser in anterior portion), interstices on average broader than diameter of punctures. Hind wings fully developed. Metatarsomere I approximately as long as the combined length of II–IV, or nearly so.

Abdomen (Fig. 116) approximately 0.95 times as broad as elytra and with moderately deep anterior impressions on tergites III–V; posterior margins of tergites III–VII with fine punctation; anterior impressions of tergites III–V and anterior margin of tergite VI with sparse non-setiferous micropunctation; discs of tergites III–VI each with a median pair of setiferous punctures (individual punctures may be missing) and with some lateral punctures on either side; tergite VII with fine punctures near anterior margin and with two transverse rows each composed of approximately 8 setiferous punctures in posterior half; tergite VIII with a few setiferous punctures in posterior fourth, impunctate in anterior three-fourths; integument without microsculpture and very glossy; posterior margin of tergite VII with palisade fringe.

♂: posterior margin of tergite VIII concave in the middle, this concavity delimited by a tooth-like process on either side; sternite VIII somewhat longer than tergite VIII, its posterior margin truncate in the middle; median lobe of aedeagus approximately 0.95–1.02 mm long and shaped as in Figs. 184–185.

♀: posterior margin of tergite VIII weakly concave in the middle; posterior margin of sternite VIII weakly concave.

Comparative notes and comment

This distinctive species is readily identified based on its large size and conspicuous coloration alone. In addition, it is characterized by the punctation pattern of the abdomen and by the morphology of the aedeagus. It differs from *Z. kambaitiensis* (Yunnan, northeastern Burma), the only species of similar size and coloration known from China, by the broader and more densely punctate pronotum, the denser punctation of the head, the much darker legs (*Z. kambaitiensis*: legs pale-yellowish), and by the more slender median lobe of the aedeagus with a straight (lateral view) and relatively longer ventral process.

The type material was erroneously reported from Taiwan as *Z. wei* by Pace (2010a).

Distribution and natural history

The known distribution is confined to two localities in Taiwan (Fig. 301). The specimens were collected at altitudes of 2450 and 2850 m.

Zyras (Zyras) rufoterminalis **n. sp.**
(Figs. 16, 61, 118, 186–187, 301)

Zyras songanus: Pace (2012a); misidentification.

Type material

Holotype ♂: "China: W-Hubei daba [sic] Shan pass E of Mt. Da Shennongjia 12 km / NW Muyuping 31°30′N, 110°21′E 1950 m, A Smetana [C117] / *Zyras songanus* Pace, det. R. Pace 2005 / Holotypus ♂ *Zyras rufoterminalis* sp. n. det. V. Assing 2014" (cAss).

Paratypes: 2♂♂, 3♀♀: "China – NW Sichuan, 20 km NW Maowen, 2150 m, Jiuding Shan, coniferous wood, 7–28.VI.2004, leg. R. Fabbri" (cSch, cAss); 1♀: "China – NW Sichuan, between Shangliusuo–Luhua, 5 km E of Luhua, 2400 m, shrubs, 7–28.VI.2004, leg. R. Fabbri" (cSch); 1♂: "China (W-Hubei) Daba Shan, pass E Mt. Da Shennongjia, 12 km NW Muyuping 31°30′N, 110°21′E, 1950 m (dry creek vall., mix. decid. forest), 16.–22.VII.2001 Wrase [13]" (cAss).

Etymology

The specific epithet is composed of the Latin adjectives rufus (red) and terminalis (terminal). It alludes to the conspicuously reddish apex of the abdomen.

Description

Large species; body length 8.0–10.0 mm; length of forebody 4.0–4.6 mm. Coloration: head and pronotum (Fig. 61) blackish-brown to blackish; elytra yellowish, with the postero-lateral portions extensively triangularly blackish; abdomen (Fig. 118) blackish, with the posterior margins of segments III–VI and all of segments VII–X bright-reddish; legs yellowish; antennae (Fig. 16) blackish-brown, with antennomeres I–II sometimes indistinctly paler and with antennomere XI dark-reddish.

Head (Fig. 61) distinctly transverse, broadly impunctate along middle; punctation in lateral dorsal portions rather sparse; interstices on average broader than diameter of punctures. Eyes as long as, or slightly longer than postocular region in dorsal view. Antenna (Fig. 16) very long (3.2–3.4 mm), slender, and moderately massive; antennomeres IV–VI weakly transverse to weakly oblong, VII–X as long as broad to weakly transverse, and XI usually shorter than, more rarely as long as the combined length of IX and X.

Pronotum (Fig. 61) approximately 1.15 times as broad as long and 1.34–1.38 times as broad as head, rather weakly convex in cross-section; punctation moderately dense; interstices on average as broad as, or slightly narrower than diameter of punctures; midline narrowly impunctate; lateral margins and antero-lateral portion with some long black setae.

Elytra (Fig. 61) approximately 0.85 times as long as pronotum; punctation defined, coarser and distinctly denser than that of pronotum, interstices on average narrower than diameter of punctures. Hind wings fully developed. Metatarsomere I approximately as long as the combined length of II–IV, or nearly so.

Abdomen (Fig. 118) slightly narrower than elytra and with shallow anterior impressions on tergites III–V; posterior margins of tergites III–VI each with a row of rather dense setiferous punctures bearing long yellowish setae; remainder of surfaces of tergites III–VI, including anterior portions, with few scattered punctures, occasionally nearly impunctate; tergite VII with moderately dense punctation in anterior fourth and very scattered punctures in posterior three-fourths; tergite VIII with some setiferous punctures bearing long black setae in posterior portion; integument without microsculpture and very glossy; posterior margin of tergite VII with palisade fringe; posterior margin of tergite VIII concave in the middle.

♂: posterior concavity of tergite VIII delimited by a more or less pronounced tooth-like process on either side; sternite VIII somewhat longer than tergite VIII, its posterior margin convex; median lobe of aedeagus approximately 1.1 mm long and shaped as in Figs. 186–187.

♀: posterior margin of tergite VIII not dentate on either side of median concavity; posterior margin of sternite VIII weakly concave in the middle.

Comparative notes and comment

This distinctive species is characterized by its conspicuous coloration (of the *shaanxiensis* type, but with reddish abdominal apex), large body size, very long antennae (longer than in any of the other species recorded from China), the very sparse punctation of the abdomen, and by the morphology of the aedeagus.

Remarkably, the holotype had been identified as *Z. songanus* Pace, 1993, a species known only from Beijing, by R. Pace. This species, however, is much smaller (5.6–6.3 mm), of different coloration, and much more densely punctate on the abdomen.

Distribution and natural history

The species was discovered in three localities in northwestern Sichuan and western Hubei (Fig. 301). The specimens were collected in a coniferous forest, in a shrub habitat, and in a mixed deciduous forest at altitudes of 1900–2400 m.

Zyras (Zyras) birmanus Scheerpeltz, 1965
(Figs. 17, 64, 124, 188–189, 303)

Zyras (Zyras) birmanus Scheerpeltz, 1965: 350 f.
Zyras (Zyras) pseudobirmanus Scheerpeltz, 1965: 351 f.; **n. syn.**

Type material examined

Z. birmanus: Paratypes: 1 ♀: "♀ / N. E. Burma, Kambaiti, 2000 m, 14/5.1934, Malaise / Schwedische Indien-Burma Expedition 1934 / ex coll. Scheerpeltz / Allotypus / Typus *Zyras birmanus* O. Scheerpeltz / *birmanus* Schp. / *Zyras birmanus* Scheerpeltz, det. V. Assing 2015" (NHMW); 3 exs.: same data, but "7–9/6.1934 … Cotypus *Zyras birmanus* O. Scheerpeltz" (NHMW); 1 ex.: same data, but "12/5 1934, 7000 ft." (NHMW); 1 ex.: same data, but "25–27/4 1934" (NHMW).

Z. pseudobirmanus: Holotype ♀: "N. E. Burma, Kambaiti 7000 ft., 12/5 1934, R. Malaise / Holotypus / Typus *Zyras pseudobirmanus* O. Scheerpeltz / *Zyras (Zyras) pseudobirmanus* n. sp., det. Scheerpeltz 1941 / 3812, E91 + / NHRS-JLKB 000023267 / *Zyras birmanus* Scheerpeltz, det. V. Assing 2015" (SMNH).

Additional material examined

China: Yunnan: 3 ♂♂, 3 ♀♀, Dali Bai Aut. Pref., Zhemo Shan, 7 km SW Xiaguan, 25°32–33′N, 100°10–11′E, 2870–2970 m, shrubs with bamboo, oak, and rhododendron, litter sifted, 18.IX.2009, leg. Schülke & Wrase (cSch, cAss); 1 ♂, 2 ♀♀, 1 ex., Dali Bai Aut. Pref., Jizu Shan, summit plateau, 37 km NE Dali, 25°59′N, 100°22′E, 3150, mixed forest, litter and moss sifted, 5.IX.2009, leg. Schülke & Wrase (cSch, cAss); 1 ♂, Dali Bai Aut. Pref., Jizu Shan, path to cable car, 37 km NE Dali, 25°58′N, 100°23′E, 2450 m, mixed forest, sifted from litter, moss and pine apples, 5.IX.2009, leg. Schülke (cSch); 1 ♀, Dali Bai Aut. Pref., mountain range E Weishan, 12 km NE Weishan, 25°17′N, 100°22′E, 2630–2660 m, shrubs with pine and bamboo, litter sifted, 15.IX.2009, leg. Wrase (cAss); 1 ♂, 2 ♀♀, Dali Bai Aut. Pref., Diancang Shan W Dali, 25°42′N, 100°06′E, 2970 m, sifted at rock edges and under small shrubs, 28.V.2007, leg. Schülke (cSch, cAss); 1 ♂, Dali Bai Aut. Pref., Diancang Shan, 3 km W Dali old town, pine forest at "Cloud Road", right upper chairlift station, 25°41′N, 100°07′E, 2750 m, vinegar trap, 17.–23.VI.2005, leg. Wrase (cSch); 1 ♂, 1 ♀, 1 ex., Lijiang Naxi Aut. Co., E Yulongxue Shan, 30 km N Lijiang, 27°09′N, 100°15′E, 2800–2900 m, creek valley, secondary mixed forest, 13.VIII.2003, leg. Schülke (cSch, cAss); 1 ♀, same data, but leg. Smetana [labelled "*Zyras songanus* Pace, det. R. Pace 2005"] (cSme); 1 ♂, 1 ♀, Baoshan Pref., Gaoligong Shan, near Xiaoheishan N. R., 35 m SE Tengchong, 24°50′N, 98°46′E, 2110 m, primary deciduous forest, litter sifted, 30.V. and 4.VI.2007, leg. Wrase (cSch, cAss); 1 ♀, Baoshan Pref., 10 km SE Kambaiti pass, 45 km NW Tengchong, 25°21′N, 98°14′E, 1700–1800 m, primary forest, litter and mushrooms sifted, 29.VIII.2009, leg. Schülke (cSch); 1 ♂, Baoshan Pref., Gaoligong Shan, 33 km SE Tengchong, 24°51′N, 98°46′E, 2150 m, degraded primary deciduous forest, litter, wood, mushrooms sifted, leg. Schülke (cSch).

Comment

The type localities of *Z. birmanus* and *Z. pseudobirmanus* are identical ("N. E. Burma, Kambaiti"). The original description of the former is based on 16 specimens, that of the latter on a single female holotype (Scheerpeltz 1965). According to the original description of *Z. pseudobirmanus*, this species is distinguished from *Z. birmanus* by slight differences in coloration, proportions, and punctation. A comparison of the holotype with the type material of *Z. birmanus* and with the additional material listed above, however, yielded no evidence whatsoever that it should represent a distinct species. All the distinguishing characters indicated by Scheerpeltz (1965) are well within the range of intraspecific variation of *Z. birmanus*. Both *Z. birmanus* and *Z. pseudobirmanus* were described in the same article; the former is designated as the senior name.

One of the females listed as additional material above had been identified by Pace as *Z. songanus*.

Redescription

Body length 6.5–8.0 mm; length of forebody 2.8–3.2 mm. Coloration: head and pronotum black; elytra dark-yellowish, with the postero-lateral portions extensively black (Fig. 64); abdomen (Fig. 124) blackish, with the posterior margins of tergites III–VIII and the paratergites bright reddish-yellow and paratergites V–VI weakly infuscate in the middle; legs and maxillary palpi dark-yellowish; antennae (Fig. 17) blackish-brown, with the basal 2–3 antennomeres and antennomere XI reddish.

Head (Fig. 64) distinctly transverse, broadly impunctate along middle; punctation in lateral dorsal portions sparse; interstices on average distinctly broader than diameter of punctures. Eyes longer than postocular region in dorsal view. Antenna (Fig. 17) 2.4–2.5 mm long and moderately massive; antennomere IV as long as broad or even oblong; V–X gradually and weakly increasing in width; X rather weakly transverse; XI distinctly shorter than the combined length of IX and X.

Pronotum (Fig. 64) usually 1.14–1.18 times as broad as long and 1.30–1.35 times as broad as head; punctation similar to that of head; interstices on average distinctly broader than diameter of punctures; midline narrowly impunctate; lateral margins with few long setae.

Elytra (Fig. 64) 0.80–0.83 times as long as pronotum; punctation denser and coarser than that of pronotum, but interstices still broader than diameter of punctures. Hind wings fully developed. Metatarsomere I as long as, or longer than the combined length of II–IV.

Abdomen (Fig. 124) 0.90–0.96 times as broad as elytra, with rather shallow anterior impressions on tergites III–V, and with conspicuously sparse non-setiferous punctation; anterior impressions of tergites III–V impunctate or with few fine punctures, discs of these tergites practically impunctate aside from few scattered punctures laterally and a row of sparse setiferous punctures bearing long dark setae at posterior margins; posterior margin of tergite III impunctate; tergite VI anteriorly with few fine non-setiferous punctures, with a row of sparse setiferous punctures at posterior margin, and with or without a pair of setiferous punctures on disc; tergite VII anteriorly with a transverse band of moderately dense fine non-setiferous punctures, a row of sparse setiferous punctures at posterior margin, and with scattered punctures on disc; tergite VIII with sparse punctation anteriorly and posteriorly; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe.

♂: posterior margin of tergite VIII concave in the middle; sternite VIII somewhat longer than tergite VIII, its posterior margin truncate to weakly convex in the middle; median lobe of aedeagus 0.80–0.87 mm long and shaped as in Figs. 188–189.

♀: posterior margin of tergite VIII weakly concave in the middle.

Intraspecific variation

Aside from the usual variability of body size, this species is subject to some variation of antennal morphology, the coloration of the antennae (antennomere III reddish or infuscate), the coloration of the abdominal tergite VIII (completely reddish to blackish with reddish margins), and even the shape of the pronotum. In one female from the Yulongxue Shan the pronotum is distinctly larger than in the other specimens examined. Moreover, the apex of the ventral process of the aedeagus is somewhat stouter in the type material than in the additional material from Yunnan.

Comparative notes

Among the species with a similar coloration pattern and of similar size, *Z. birmanus* is characterized by the relatively sparse punctation of the forebody, the conspicuously sparsely punctate, partly impunctate abdomen, as well as by the morphology of the aedeagus.

Distribution and natural history

Originally described from northeastern Burma, *Z. birmanus* is also widespread and evidently rather common in western Yunnan (Fig. 303). It was collected in various kinds of forest and shrubland habitats, mostly by sifting litter and moss, at altitudes between approximately 1750 and 3150 m. One specimen was collected with a vinegar trap.

Zyras (Zyras) shaanxiensis Pace, 1998
(Figs. 18, 65, 125, 190–192, 302)

Zyras (Zyras) shaanxiensis Pace, 1998: 971.

Type material examined

Holotype ♂: "China – Shaanxi, Nanwutai, 17-IX-95, Rougemont / Holotypus *Zyras shaanxiensis* m., det. R. Pace 1996 / *Zyras shaanxiensis* sp. n., det. R. Pace 1996 / *Zyras shaanxiensis* Pace, det. V. Assing 2015" (MHNG).

Additional material examined

China: Shaanxi: 1 ex., Daba Shan, 22 km NW Zhenping, SE pass, 32°00′N, 109°21′E, 1930 m, 11.VII.2001, leg. Schülke (cSch); 1 ex., Daba Shan, 20 km NW Zhenping, creek valley SE pass, 31°59′N, 109°22′E, 1680 m, 11.VII.2001, leg. Schülke (cSch); 1 ex., Daba Shan, Ten'ja village, 31°55′N, 109°05′E, 2200–2600 m, 18.–27.VI.2004, leg. Plutenko (cSch); 1 ex., Qinling Shan, pass on road Zhouzhi–Foping, 33°46′N, 107°58′E, 1700 m, stream valley, mixed deciduous forest, moss sifted, 3.VII.2001, leg. Schülke (cAss); 1 ex., same data, but 1700–1990 m, 2.–4.VII.2001, leg. Wrase (cSch); 1 ex., 118 km E Xian, Qinling Shan, Hua Shan, 34°27′N, 110°06′E, 1200–1400 m, deciduous forest, 18.–20.VIII.1995, leg. Wrase (cSch). – Gansu: 10 exs., N Chengxian, W-Qinling Shan, 34°08′N, 105°47′E, 1760 m, N-slope, secondary deciduous forest margin, sifted, 28.VII.2012, leg. Assing & Schülke (cAss, cSch); 12 exs., N Chengxian, W-Qinling Shan, 34°10′N, 105°43′E, 1850 m, mixed

secondary forest margin, litter sifted, 29.VII.2012, leg. Assing, Schülke & Wrase (cAss, cSch); 14 exs., N Chengxian, W-Qinling Shan, 34°10′N, 105°42′E, 1830 m, stream valley with secondary deciduous forest, moist litter sifted, 29.VII.2012, leg. Assing, Schülke & Wrase (cAss, cSch); 5 exs., mountains SE Longnan, 33°11′N, 105°14′E, 2030 m, N-slope with scree, moss, fern roots, and moist litter sifted, 31.VII.2012, leg. Assing & Schülke (cAss, cSch); 4 exs., mountains SE Longnan, 33°11′N, 105°14′E, 2060 m, N-slope with scree, shrub litter and moss sifted, 7.VIII.2012, leg. Assing & Wrase (cAss, cSch); 1 ex., W-Qinling Shan, NW Longnan, 34°03′N, 104°10′E, 2200 m, SW-slope with shrubs, litter sifted, 1.VIII.2012, leg. Wrase (cSch); 1 ex., W-Qinling Shan, NW Longnan, Lazikou pass, S-side, Laolong valley, 34°08′N, 103°52′E, 2300 m, S-slope with pine and spruce forest, litter sifted, 3.VIII.2012, leg. Wrase (cSch); 1 ex., S Longnan, Min Shan, 33°03′N, 104°41′E, 2200 m, secondary pine forest with hazelnut, moist litter and roots sifted, 6.VIII.2012, leg. Assing (cAss); 1 ex., Min Shan, 60 km NW Wudu, 10.–20.VI.2005, leg. Patrikeev (cSch). – Shaanxi/Hubei/Chongqing: 1 ex., Daba Shan, pass 20 km SSE Zhenping, 31°44′N, 109°35′E, 1700–1800 m, stream valley, young mixed forest, litter and moss sifted, 9.–12.VII.2001, leg. Wrase (cSch). – Sichuan: 4 exs., 20 km NW Maowen, Jiuding Shan, 2150 m, coniferous forest, 7.–28.VI.2004, leg. Fabbri (cSch, cAss); 1 ex., between Shangliusuo and Luhua, 5 km E Luhua, 2400 m, shrubs, 7.–28.VI.2004, leg. Fabbri (cAss). – Yunnan: 1 ♀, mountains W Dongchuan, Sedan Snow Mountain Scenic Resort, 26°06′N, 102°55′E, 2620 m, secondary pine forest, litter, moss, and roots sifted, 14.VIII.2014, leg. Schülke (cSch); 1 ♀, Dali Bai Aut. Pref., 1 km W Dali old town, stream valley at foothill of Diancang Shan, 25°42′N, 100°08′E, 2170 m, fallow, 28.VIII.–3.IX.2003, leg. Wrase (cAss).

Comment

The original description is based on a unique male holotype from "Shaanxi, Nanwutai" deposited in MHNG (Pace 1998).

Redescription

Body length 5.6–7.2 mm; length of forebody 2.8–3.4 mm. Coloration: head and pronotum blackish; elytra reddish-yellow with more or less extensively blackish postero-lateral portions (Fig. 65); abdomen (Fig. 125) with reddish-yellow paratergites (often with middle of paratergites V and VII weakly infuscate); tergite III uniformly pale-reddish, occasionally brownish in the middle; tergites IV–VIII dark-brown to blackish, with the posterior margins sharply and broadly reddish-yellow; legs yellow; antennae (Fig. 18) dark-brown to blackish-brown with antennomeres I–II, (base of) III, and XI reddish; maxillary palpi yellowish.

Head (Fig. 65) distinctly transverse, broadly impunctate along middle; punctation in lateral dorsal portions moderately coarse and moderately sparse to moderately dense. Eyes slightly longer than postocular region in dorsal view. Antenna (Fig. 18) 2.2–2.5 mm long and rather massive; antennomere IV approximately as long as broad or weakly transverse; antennomeres V–X weakly transverse and of gradually increasing width; X less than 1.5 times as broad as long; XI approximately as long as the combined length of IX and X, or nearly so.

Pronotum (Fig. 65) weakly transverse, 1.09–1.13 times as broad as long and usually 1.35–1.40 times as broad as head; punctation moderately coarse, moderately dense, and nearly equally distributed; midline narrowly impunctate.

Elytra (Fig. 65) 0.75–0.80 times as long as pronotum; punctation moderately coarse and dense. Hind wings fully developed. Metatarsomere I approximately as long as the combined length of II–IV.

Abdomen (Fig. 125) slightly narrower than elytra, with rather shallow anterior impressions on tergites III–V; anterior impressions of tergites III–V usually with sparse, more rarely with denser non-setiferous punctures; tergite III with a median pair of punctures at or near posterior margin, with a lateral puncture on either side, and with scattered very fine punctures at posterior margin; tergite IV with a pair of median punctures, with a lateral puncture on either side, and with 8–10 punctures at posterior margin; tergite V with a pair of median punctures, with one, sometimes several lateral punctures on either side, and with approximately 10 punctures at posterior margin; tergite VI with a transverse row of non-setiferous punctures near anterior margin, with a transverse row of usually six punctures in posterior half, and with approximately 10 punctures at posterior margin; tergite VII with moderately dense non-setiferous punctures in anterior portion and with moderately dense setiferous punctures usually not arranged in distinct transverse series in posterior portion; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe; posterior margin of tergite VIII with shallow concavity in the middle.

♂: sternite VIII longer than tergite VIII, its posterior margin nearly truncate in the middle; median lobe of aedeagus approximately 0.8–0.9 mm long and shaped as in Figs. 190–192; apical lobe of paramere rather long and slender.

♀: posterior margin of tergite VIII broadly and shallowly concave in the middle.

Intraspecific variation

The female from the Diancang Shan in Yunnan differs from other specimens examined by darker coloration (elytra more extensively blackish, yellowish only near anterior margins and in humeral portion; posterior margins of abdominal tergites III–VIII more narrowly and more darkly reddish; maxillary palpi brown with yellowish terminal palpomere), but otherwise no evidence was found suggesting that it should represent a different species.

Comparative notes

Among the consubgeners of similar size and coloration known from China, *Zyras shaanxiensis* is characterized

particularly by the moderately massive antennae, the large (in relation to head) but rather weakly transverse pronotum, the punctation pattern of the abdomen, the shape of the median lobe of the aedeagus, and the relatively long apical lobe of the paramere.

Distribution and natural history

This species is widespread and apparently common in the Qinling Shan and adjacent mountain ranges (Shaanxi, Gansu) and present also in the Daba Shan, eastwards to the border region between Shaanxi, Hubei, and Chongqing, and in Sichuan (Fig. 302). The above records from Yunnan are based exclusively on females and consequently not absolutely reliable. PACE (2012a) recorded the species from the Emei Shan in Sichuan. The examined specimens were sifted from litter in various forest, shrub, and ruderal habitats at altitudes between 1680 and 2620 m. Two specimens collected in July and August are teneral.

Zyras (Zyras) wei Pace, 1993
(Figs. 19, 66, 126, 193–194, 306)

Zyras (Zyras) wei PACE, 1993: 114.
Zyras (Zyras) qingchengensis PACE, 2012a: 85; **n. syn.**

Type material examined

Z. wei: Holotype ♀: "China X.1986, Guizhou: Huaxi, G. DE ROUGEMONT / Holotypus *Zyras wei* m., det. R. PACE 1987 / *Zyras wei* sp. n., det. R. PACE 1987" (cRou).

Z. qingchengensis: Holotype ♂: "China, Sichuan, Qingcheng Shan, 65 km NW Chengdu, 103.33 E, 30.53 N, 18.V/3.–4.VI.1997, 8 km W Taiping, 800–1000 m, leg. A. PÜTZ / Holotypus *Zyras qingchengensis* mihi, det. R. PACE 2009 / *Zyras qingchengensis* n. sp., det. R. PACE 2009 / *Zyras wei* Pace, det. V. ASSING 2015" (cPüt). – Paratypes: 2 ♀♀: same data as holotype (cPüt); 1 ♂: "China: Sichuan, Ganzi Pref., Daxue Shan, 101.57 E, 30.02 N, N Kangding, 2600–2700 m, 22./24.V.1997, leg. A. PÜTZ / Paratypus *Zyras qingchengensis* mihi, det. R. PACE 2009 / *Zyras qingchengensis* n. sp., det. R. PACE 2009 / *Zyras* sp. prope *athetoides*, det. V. ASSING 2015" (cPüt).

Additional material examined

China: 1 ♂, Fujian, Wuyi Shan Nat. Res., Sangang env., 900 m, 30.V.–12.VI.2001, leg. HLAVÁČ & COOTER (cAss); 1 ♀, Zhejiang, Tianmu Shan, pass 25 km NNW Linan, 30°26′N, 119°36′E, 620–820 m, stream valley with mixed forest and bamboo, litter sifted, 16.VI.2007, leg. WRASE (cSch); 1 ♂, Sichuan, Wenjiang Distr., Dujiangyan Co., 56 km NW Chengdu, Qingcheng Shan, 30°54′N, 103°33′E, 975 m, 18.VI.1999, leg. SCHÜLKE (cAss).

Comment

The original description of *Z. wei* is based on a single female from "Guizhou, Huaxi" (PACE 1993), that of *Z. qingchengensis* on five specimens collected in the Qingcheng Shan and near Kangding in Sichuan (PACE 2012a). An examination of the type material of both names revealed that the type series of *Z. qingchengensis* is undoubtedly composed of two species, but yielded no evidence whatsoever that the holotype and the paratypes of *Z. qingchengensis* from the Qingcheng Shan, the holotype of *Z. wei*, and the additional material listed above should represent different species. Consequently, *Z. qingchengensis* is placed in synonymy with the senior name *Z. wei*. The examined paratype from the region to the north of Kangding, evidently a nanistic specimen, is distinguished from *Z. wei* by numerous characters, particularly the different punctation, the much sparser punctation of the forebody and the abdomen, and the different morphology of the antennae. Among the described *Zyras* species known from China, it is most similar to *Z. athetoides*.

Redescription

Body length 6.2–7.5 mm; length of forebody 2.5–2.9 mm. Coloration: head and pronotum blackish-brown; elytra with yellow posterior margin, otherwise variable: blackish brown with humeral portion extensively reddish, or yellowish-red with lateral spot and scutellar region more or less extensively infuscate (Fig. 66); abdomen (Fig. 126) blackish brown, with the paratergites and the posterior margins of the segments yellowish-red to red; legs yellowish; antennae (Fig. 19) dark-reddish to blackish-brown, with antennomeres I–II and base of III yellowish-red to red, and with apex of XI reddish-brown to brown.

Head (Fig. 66) distinctly transverse, narrowly to broadly impunctate along middle; punctation in lateral dorsal portions moderately dense; interstices on average approximately as broad as punctures. Eyes noticeably longer than postocular region in dorsal view. Antenna (Fig. 19) 2.0–2.3 mm long and moderately massive; antennomeres IV–V as long as broad or weakly transverse; V–X gradually increasing in width; X weakly transverse; XI as long as, or slightly shorter than the combined length of IX and X.

Pronotum (Fig. 66) 1.15–1.20 times as broad as long and 1.33–1.40 times as broad as head; punctation dense and very defined; midline narrowly impunctate; lateral margins with few long black setae.

Elytra (Fig. 66) approximately 0.75–0.80 times as long as pronotum; punctation coarse and dense; interstices distinctly narrower than diameter of punctures. Hind wings fully developed. Metatarsomere I as long as, or slightly longer than the combined length of II–IV.

Abdomen (Fig. 126) slightly narrower than elytra, with moderately deep anterior impressions on tergites III–V; anterior impressions of tergites III–V and anterior portions of tergites VI–VII with distinct and dense non-setiferous punctation; posterior margins of tergites III–VI each with a row of setiferous punctures; discs of tergites III–VIII with sparse irregular punctation usually not arranged in distinct transverse rows (rarely, irregular transverse

series may be present on tergites VI–VII); tergite VIII with rather dense punctation in posterior portion, fine and sparse punctation in antero-lateral portions, and impunctate in antero-median portion; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe.

♂: posterior margin of tergite VIII truncate or weakly concave in the middle; sternite VIII somewhat longer than tergite VIII and convex posteriorly; median lobe of aedeagus 0.72–0.80 mm long and shaped as in Figs. 193–194.

♀: posterior margin of tergite VIII truncate in the middle; posterior margin of sternite VIII weakly concave in the middle.

Comparative notes and comment

Among the species with a similar coloration pattern and of similar size, *Z. wei* is characterized by the dense, defined, and rather coarse punctation of the forebody (especially of the elytra), the punctation pattern of the abdomen (especially the usually irregular punctation on tergites III–VII), by the posteriorly truncate tergite VIII, and by the morphology of the aedeagus.

Distribution and natural history

Confirmed records are known only from the type locality in Guizhou, the Tianmu Shan in Zhejiang, the Wuyi Shan in Fujian, and the Qingcheng Shan in Sichuan, China (Fig. 306). Pace (2010a, 2012a) reported the species also from several other localities in Hubei, Shaanxi, Sichuan, Yunnan, and Taiwan. However, an examination of additional material identified by R. Pace as *Z. wei* revealed that it was composed of at least five [sic] different species and in fact not a single specimen was conspecific with the holotype of *Z. wei*, suggesting that most likely all other previous records from various localities in China and Taiwan (Pace 2010a, 2012a) are based on misidentifications.

Zyras (Zyras) firmicornis **n. sp.**

(Figs. 20, 67, 127, 195–196, 301)

Type material

H o l o t y p e ♂: "China: Fujian prov., Wuyi Shan Nat. Res., Sangan env. (900 m), 30.V.–12.VI.2001, Hlaváč & Cooter lgt. / Holotypus ♂ *Zyras firmicornis* sp. n. det. V. Assing 2014" (cAss).

Etymology

The specific epithet (Latin, adjective) alludes to the massive antennae, one of the characters distinguishing this species from the similar syntopic *Z. wei*.

Description

Body length 6.7 mm; length of forebody 2.9 mm. Coloration: head and pronotum blackish-brown; elytra yellowish, with a relatively small dark spot in postero-lateral angles (Fig. 67); abdomen (Fig. 127) blackish-brown with the posterior margins of the segments and the paratergites (except for the middle of paratergites VI and VII) dark-yellowish; legs and maxillary palpi yellowish; antennae (Fig. 20) blackish-brown with antennomeres I–II pale-reddish and XI slightly paler than X.

Head (Fig. 67) distinctly transverse, broadly impunctate along middle; punctation in lateral dorsal portions moderately dense; interstices on average approximately as broad as diameter of punctures. Eyes slightly longer than postocular region in dorsal view. Antenna (Fig. 20) approximately 2.2 mm long and massive; antennomere IV distinctly transverse; V–X gradually increasing in width; X moderately transverse, slightly less than 1.5 times as broad as long; XI approximately as long as the combined length of IX and X.

Pronotum (Fig. 67) large, 1.22 times as broad as long and 1.37 times as broad as head; punctation moderately dense; interstices on average slightly broader than diameter of punctures; midline narrowly impunctate; lateral margins with few long black setae.

Elytra (Fig. 67) 0.76 times as long as pronotum; punctation similar to that of pronotum. Hind wings fully developed. Metatarsomere I as long as the combined length of II–IV.

Abdomen (Fig. 127) nearly as broad as elytra, with shallow anterior impressions on tergites III–V; anterior impressions of tergites III–V and anterior portions of tergites VI–VII with fine and moderately sparse non-setiferous punctation; posterior margins of tergites III–VI each with row of sparse setiferous punctures bearing long setae, posterior margin of tergite VII with numerous punctures bearing short setae; disc of tergite III with transverse row of 4 setiferous punctures; discs of tergites IV–V each with 6 setiferous punctures; disc of tergite VI with transverse series of approximately 8 setiferous punctures; tergite VII anteriorly with rather numerous oblong non-setiferous punctures, in posterior half with numerous setiferous punctures arranged in three irregular transverse rows; tergite VIII with sparse setiferous punctures in posterior fourth, and with few scattered punctures in anterior three-fourths; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe.

♂: posterior margin of tergite VIII truncate in the middle; sternite VIII somewhat longer than tergite VIII and strongly convex posteriorly; median lobe of aedeagus approximately 0.9 mm long and shaped as in Figs. 195–196.

♀: unknown.

Comparative notes

Zyras firmicornis is distinguished from the similar and syntopic *Z. wei* by the more massive antennae, the different punctation pattern of the abdomen, and by the distinctly larger and differently shaped median lobe of the aedeagus.

Distribution and natural history

The type locality is situated in the Wuyi Shan, Fujian province (Fig. 301), at an altitude of 900 m.

Zyras (Zyras) subobsoletus **n. sp.**
(Figs. 21, 73, 129, 197–198, 301)

Type material

Holotype ♂: "China S.Sichuan (Ya'an Pref., Shimian Co.), Xiaoxiang Ling, side-valley above Nanya Cun nr. Caluo, 11 km S Shimian, ca. 1250 m, 12.VII.1999 D. W. Wrase / Holotypus ♂ *Zyras subobsoletus* sp. n. det. V. Assing 2014" (cAss).

Paratypes: 2♀♀: "China: S-Sichuan 1999, Ya'an Prefecture, Shimian Co., Xiaoxiang Ling, Pass zw. Shimian u. Ganluo, 27 km SE Shimian, 29°03′N, 102°31′E, 2450 m, Quellsumpf, Bachufer, 8.VII., leg. M. Schülke" (cSch).

Etymology

The specific epithet (Latin, adjective) alludes to the almost obsolete black markings of the elytra.

Description

Body length 6.5–7.0 mm; length of forebody 2.7–3.0 mm. Coloration: head and pronotum black; elytra yellowish, with more or less reduced dark spots in or near postero-lateral angles (Fig. 73) (in holotype reduced to small, diffuse, and indistinct spot at lateral margin); abdomen (Fig. 129) blackish-brown to black, with the posterior margins of the segments reddish; legs yellowish; antennae (Fig. 21) dark-brown with antennomeres I–II and XI reddish to brown.

Head (Fig. 73) distinctly transverse, broadly impunctate along middle; punctation in lateral dorsal portions moderately sparse; interstices on average broader than punctures. Eyes noticeably longer than postocular region in dorsal view. Antenna (Fig. 21) 2.2–2.4 mm long and moderately massive; antennomeres IV–X weakly transverse, gradually and weakly increasing in width; XI approximately as long as the combined length of IX and X.

Pronotum (Fig. 73) approximately 1.16–1.22 times as broad as long and 1.3 times as broad as head; punctation rather sparse and fine; interstices on average broader than diameter of punctures; midline narrowly impunctate; lateral margins with few long thin brownish setae.

Elytra (Fig. 73) 0.75–0.80 times as long as pronotum; punctation similar to that of pronotum. Hind wings fully developed. Metatarsomere I approximately as long as the combined length of II–IV.

Abdomen (Fig. 129) broad, nearly as broad as elytra, with shallow anterior impressions on tergites III–V; anterior impressions of tergites III–V and anterior portions of tergites VI–VII with fine and moderately dense to sparse non-setiferous punctation; posterior margins of tergites III–VII each with a row of setiferous punctures; discs of tergites III–IV sparsely punctate to nearly impunctate, with or without an additional pair of coarser punctures; discs of tergites V–VI with a more or less distinct transverse row of setiferous punctures posteriorly and with scattered additional fine punctures; tergite VII in posterior half with sparse punctation occasionally arranged in indistinct transverse series; tergite VIII with moderately dense punctation in posterior third; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe; posterior margin of tergite VIII with shallow concavity in the middle, without evident sexual dimorphism.

♂: sternite VIII slightly longer than tergite VIII and convex posteriorly; median lobe of aedeagus 0.75 mm long and shaped as in Figs. 197–198.

♀: posterior margin of sternite VIII truncate in the middle.

Comparative notes

Regarding its coloration (*shaanxiensis* type, but with reduced elytral spots), *Z. subobsoletus* is most similar to *Z. sibiricus* and *Z. firmicornis*. It differs from both particularly by the more slender antennomere III, the punctation pattern of the abdomen, and by the shape of the median lobe of the aedeagus, from *Z. sibiricus* additionally by the sparser punctation of the pronotum and the elytra, as well as by the darker coloration of the pronotum. Regarding antennal morphology, habitus, the punctation pattern of the abdomen, and the shape of the median lobe of the aedeagus, *Z. subobsoletus* is most similar to *Z. wei*, from which it differs by the less dense punctation of the pronotum and the elytra, the less transverse pronotum, and by the morphology of the aedeagus (crista apicalis more oblique; ventral process apically more slender in lateral view and shorter in ventral view). More material would be required to assess whether these differences are constant and indeed an expression of interspecific variation. The possibility that they are within the range of intraspecific variation can, at present, not be ruled out with certainty.

Distribution and natural history

The known distribution is confined to two localities in the Xiaoxiang Ling, southern Sichuan (Fig. 301). The specimens were collected at 1250 and 2450 m, the two paratypes in a swampy habitat.

Zyras (Zyras) sibiricus Bernhauer, 1914
(Figs. 14, 22, 74, 110, 130, 140, 199–200, 209–210, 304)

Zyras sibiricus Bernhauer, 1914: 68.

Material examined

China: 2♂♂, 1♀, Beijing distr., Yan Shan, Dongling Mountains, Xiaolongmen, 1400 m, 15.–16.VI.2001, leg. Hlaváč & Cooter (cAss, cHla).

Comment

The original description is based on "ein einziges Weibchen" from "Ost-Sibirien (Schipka-Gora)" (BERNHAUER 1914). A high-resolution photograph of this specimen was made available to me by MUNETOSHI MARUYAMA. The redescription below is based on the examined material from China.

Redescription

Body length 5.7–7.2 mm; length of forebody 2.8–3.1 mm. Coloration: head blackish-brown; pronotum dark-brown; elytra yellowish, with or without a small, weakly defined, and weakly infuscate spot in or near postero-lateral angles (Fig. 74); abdomen (Fig. 130) brown with the anterior margins and the broad posterior margins of the segments and the paratergites dark-yellowish; legs yellowish; antennae (Figs. 14, 22) reddish to dark-reddish, with antennomeres I–II and XI paler red.

Head (Figs. 74, 110) distinctly transverse, broadly impunctate along middle; punctation in lateral dorsal portions moderately dense; interstices on average approximately as broad as punctures. Eyes noticeably longer than postocular region in dorsal view. Antenna (Figs. 14, 22) approximately 2.3 mm long and rather massive; antennomere IV as long as broad or weakly transverse; V–X gradually increasing in width; X rather weakly transverse; XI shorter than the combined length of IX and X.

Pronotum (Figs. 74, 110) approximately 1.18 times as broad as long and 1.3 times as broad as head; punctation similar to that of head, but slightly coarser on average; midline narrowly impunctate; lateral margins without long setae.

Elytra (Figs. 74, 110) approximately 0.85 times as long as pronotum; punctation similar to that of pronotum. Hind wings fully developed. Metatarsomere I as long as, or slightly longer than the combined length of II–IV.

Abdomen (Figs. 130, 140) approximately 0.9 times as broad as elytra, with moderately deep anterior impressions on tergites III–V; anterior impressions of tergites III–V and anterior portions of tergites VI–VII with fine and moderately distinct non-setiferous punctation; posterior margins of tergites III–VII each with a row of setiferous punctures; discs of tergites III–V each with two irregular transverse rows of punctures; disc of tergite VI with moderately sparse, that of tergite VII with very sparse irregular punctation; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe.

♂: posterior margin of tergite VIII weakly concave in the middle; sternite VIII somewhat longer than tergite VIII and convex posteriorly; median lobe of aedeagus (Figs. 199–200, 209–210) 0.67–0.73 mm long and with slender ventral process in lateral view.

♀: posterior margin of tergite VIII weakly concave in the middle; posterior margin of sternite VIII truncate in the middle.

Intraspecific variation

The specimens from Beijing (Figs. 22, 74, 130, 199–200) differ from material examined from Hokkaido (Figs. 14, 110, 140, 209–210) by slightly finer punctation of the anterior abdominal tergites, a slightly more convex pronotum (cross-section), and the slightly different shape and orientation of the crista apicalis of the aedeagus. However, these differences are not very pronounced and tentatively interpreted as intraspecific variation.

Comparative notes

Among the Chinese species with a similar coloration pattern and of similar size, *Z. sibiricus* somewhat resembles *Z. shaanxiensis*, but differs by the absent or indistinctly infuscate posterior spots on the elytra, the paler antennomeres IV–X, the punctation of the abdomen (*Z. shaanxiensis*: anterior impressions of tergites III–V and anterior portion of tergite VI very sparsely punctate; discs of tergites III–VI with very sparse punctures not arranged in transverse rows; tergite VII with denser punctation), and by the morphology of the median lobe of the aedeagus. *Zyras sibiricus* is also similar to *Z. optatus* (one female from Honshu examined), but distinguished by the less extensive and less distinct postero-lateral spots on the elytra, the slightly longer antennae (*Z. optatus*: 2.1 mm), the less dense non-setiferous punctation of the anterior impressions of tergites III–V and of the anterior portions of tergites VI–VII, as well as by the more extensive and denser setiferous punctation of the posterior portions of tergites III–V.

Distribution and natural history

Zyras sibiricus is widespread in the East Palaearctic region and had been reported from East Siberia and North Korea (HLAVÁČ et al. 2011, SMETANA 2004). The examined material includes specimens from North Japan (Hokkaido) and one locality in China (Beijing) (Fig. 304). The partly slightly teneral specimens from Beijing were collected at an altitude of 1400 m.

Zyras (Zyras) bangmaicus **n. sp.**

(Figs. 23, 75, 131, 205–206, 301)

Type material

Holotype ♂: "China: Yunnan, Lincang Pref., Bang-ma Shan, 33 km SSW Lincang, 2150 m, 23°35′41″N, 100°00′27″E, decid. forest remnant, N-slope, litter and dead wood sifted, 11.IX.2000, leg. M. SCHÜLKE [CH09-42] / Holotypus ♂ *Zyras bangmaicus* sp. n. det. V. ASSING 2014" (cAss).

Etymology

The specific epithet is an adjective derived from the name of the mountain where this species was discovered.

Description

Body length 7.5 mm; length of forebody 3.1 mm. Coloration: head and pronotum blackish; elytra yellowish, with the posterior two-fifths, except for the yellowish suture, extensively blackish (Fig. 75); abdomen (Fig. 131) reddish, with a transverse median spot on tergite IV and most of the discs of tergites V–VII blackish-brown; legs and maxillary palpi yellowish; antennae (Fig. 23) blackish-brown, with antennomeres I–III yellowish-red and XI dark-reddish.

Head (Fig. 75) distinctly transverse, broadly impunctate along middle in posterior half; punctation in lateral and anterior dorsal portions sparse; interstices distinctly broader than diameter of punctures. Eyes slightly longer than postocular region in dorsal view. Antenna (Fig. 23) 2.5 mm long and not particularly massive, moderately incrassate apically; antennomeres IV–V weakly oblong; VI approximately as long as broad; VII–X gradually increasing in width and increasingly transverse; X approximately 1.5 times as broad as long; XI approximately as long as the combined length of IX and X.

Pronotum (Fig. 75) 1.12 times as broad as long and 1.21 times as broad as head; punctation rather coarse, irregularly spaced, and sparse, particularly in antero-lateral portions of disc; interstices on average broader than diameter of punctures; midline narrowly impunctate; lateral margins without long setae.

Elytra (Fig. 75) rather long, 0.95 times as long as pronotum; punctation rather coarse, defined, and moderately dense; interstices on average slightly broader than diameter of punctures. Hind wings fully developed. Metatarsomere I approximately as long as the combined length of II–IV.

Abdomen (Fig. 131) distinctly narrower than elytra, with moderately deep anterior impressions on tergites III–V; anterior impressions of tergites III–V and anterior portion of tergite VI each with a transverse row of non-setiferous punctures; discs of tergites III–VI nearly impunctate, except for some punctures in lateral portions and a median pair of setiferous punctures on tergite III; posterior margin of tergite III impunctate; posterior margins of tergites IV–VI each with four setiferous punctures bearing long dark setae; tergite VII with some partly granulose setiferous punctures in posterior half of disc and a row of dense fine punctures at posterior margin; tergite VIII with moderately dense setiferous punctures bearing long dark setae in posterior portion, in postero-median portion smoothly elevated; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe.

♂: posterior margin of tergite VIII concave in the middle, on either side of this concavity dentate; sternite VIII longer than tergite VIII, its posterior margin strongly convex in the middle; median lobe of aedeagus 0.9 mm long and shaped as in Figs. 205–206.

♀: unknown.

Comparative notes

Among the species with a similar coloration pattern of the forebody, *Z. bangmaicus* is characterized by the coloration of the forebody, the morphology of the antennae, the relatively slender pronotum with sparse and irregularly spaced punctation, the rather long elytra, the punctation pattern of the abdomen, the smoothly elevated postero-median portion of tergite VIII, and by the shape of the median lobe of the aedeagus.

Distribution and natural history

The type locality is situated in the Bangma Shan in western Yunnan (Fig. 301). The holotype was sifted from leaf litter in a deciduous forest remnant at an altitude of 2150 m.

Zyras (Zyras) inexcisus **n. sp.**

(Figs. 37, 76, 133, 207–208)

Type material

Holotype ♂: "China: Qinghai Prov. [CH11-9e], Daban Shan, 62 km NNW Honggu, creek valley, *Picea, Populus, Betula* forest, 36°51′15–28″N, 102°36′34″–37′07″E, 2236–2350 m, creek valley, litter, dead wood & moss sifted, 10.VII.2011, leg. M. Schülke / Holotypus ♂ *Zyras inexcisus* sp. n. det. V. Assing 2014" (cAss).

Paratypes: 1 ♂: same data as holotype (cSch); 3 exs.: "China Qinghai: [09B] Daban Shan, 62 km NNW Honggu 2240 m, 36°51′28″N, 102°37′07.6″E, creek valley, *Picea-Populus-*, *Betula* forest, pitfall traps, vinegar, 11.–15.VII.2011, D. W. Wrase" (cSch); 2 exs.: "China (Qinghai Prov.), Daban Shan, 62 km NNW Honggu, 36°51′26.8″N, 102°36′50.2″E, 2275 m (creek valley, *Picea-Populus-Betula* forest, litter sifted), 26. & 29.VI.2011 D. W. Wrase [09E]" (cAss); 1 ex.: "China (Qinghai Prov.), Daban Shan, 6 km NW Honggu, 36°49′10.7″N, 102°31′22.8″E, 2366–2400 m (mixed forest: *Betula*, *Populus*, *Picea*, pitfall traps, vinegar), 11.–15.VII.2011 D. W. Wrase [08C]" (cSch); 1 ex.: "China: Qinghai Prov. [CH11-19], road 301 km 180, 43 km ESE Men Yuan, 37°09′32.6″N, 102°02′06.0″E, 2704 m, creek valley with *Picea*, *Salix*, *Populus*, *Betula*, litter and moss sifted, 5.VII.2011, leg. M. Schülke" (cSch); 1 ♀: "China: Gansu Prov. [CH11-27], Lenglong Ling Mts., 60 km NNW Honggu, Jin Sha Gorge, mixed forest (*Picea*, *Populus*, *Betula*), 36°51′06.9″N, 102°38′55.3″E, litter, moss, mushrooms sifted, 12.VII.2011, leg. M. Schülke" (cAss); 1 ♂ [teneral]: "Baikal. Trinkun [?], Sajan. Bang-Haas / *optatus* Shp., Bang-Haas. det. Bernh. / Chicago NHMus, M. Bernhauer Collection" (FMNH); 1 ♂: "*optata* Shp, Baikalsee, ded. Reitter. / Chicago NHMus, M. Bernhauer Collection" (FMNH); 1 ♀: "Quellgeb. Irkut. Leder. ded. Reitter / *optatus* Sharp Ostsibirien, determ. Bernh. / Chicago NHMus, M. Bernhauer Collection" (FMNH); 2 ♀♀: "Rußland: Primorie (S9), Schutzgebiet Sichote-Alin, Kordon Kabaniy [45°05′N, 135°5′E], 7.–13.VII.1998, leg. J. Sundukov" (cSch, cAss).

Etymology

The specific epithet (Latin, adjective) alludes to the absence of a median concavity of the posterior margin of the male tergite VIII.

Description

Body length 6.0–7.0 mm; length of forebody 2.7–3.0 mm. Coloration: head and pronotum blackish-brown; elytra dark-yellowish, with the postero-lateral portions extensively blackish-brown (Fig. 76); abdomen (Fig. 133) blackish-brown, with the posterior margins of tergites III–VIII and the paratergites yellowish-brown; legs and maxillary palpi dark-yellowish; antennae (Fig. 37) usually blackish-brown, rarely reddish-brown, with antennomeres I–II and XI paler, reddish to brown.

Head (Fig. 76) distinctly transverse, broadly impunctate along middle in posterior half; punctation in lateral and anterior dorsal portions moderately dense; interstices on average as broad as, or slightly narrower than punctures. Eyes slightly longer than postocular region in dorsal view. Antenna (Fig. 37) 1.9–2.1 mm long and not particularly massive; antennomere IV distinctly transverse; V–X gradually increasing in width; X approximately 1.5 times as broad as long; XI slightly shorter than the combined length of IX and X.

Pronotum (Fig. 76) 1.08–1.13 times as broad as long and 1.25–1.27 times as broad as head; punctation similar to that of head, but denser; midline very narrowly impunctate; lateral margins with few moderately long setae.

Elytra (Fig. 76) 0.81–0.82 times as long as pronotum; punctation dense, denser and coarser than that of pronotum. Hind wings fully developed. Metatarsomere I approximately as long as the combined length of II–IV.

Abdomen (Fig. 133) 0.94–0.98 times as broad as elytra, with moderately deep anterior impressions on tergites III–V; non-setiferous punctation of anterior impressions of tergites III–V fine and rather sparse, that of anterior portion of tergite VI moderately sparse to rather dense, and that of anterior portion of tergite VII dense; posterior margins of tergites III–VII each with row of numerous setiferous punctures; discs of tergites III–VIII with moderately dense punctation not arranged in transverse rows; tergite VIII posteriorly rather densely punctate and anteriorly almost impunctate; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe; posterior margin of tergite VIII smoothly convex, usually without, rarely with very shallow median concavity.

♂: sternite VIII somewhat longer than tergite VIII, its posterior margin truncate to weakly convex in the middle; median lobe of aedeagus 0.72–0.75 mm long and shaped as in Figs. 207–208.

♀: sternite VIII with broadly and weakly convex posterior margin.

Comparative notes

Among the species with a similar coloration pattern and of similar size, *Z. inexcisus* is characterized by relatively short and not particularly massive antennae with distinctly transverse antennomeres IV–X, the rather dense punctation of the body (particularly of the elytra), the smoothly convex posterior margin of the male tergite VIII, and by the morphology of the aedeagus. The species is distinguished from *Z. optatus* (Sharp, 1888) from Japan (one female from Honshu examined), with which it had been confounded by Bernhauer, by the less convex pronotum in cross-section, the darker antennae with more transverse antennomeres IV–X, the distinctly denser punctation of the forebody, and the more extensive and denser punctation of the abdomen. It differs from the sympatric *Z. sibiricus* by the slightly darker and shorter antennae with more transverse antennomeres IV–X, more extensive and more distinct punctation particularly of tergites VI–VIII, and by a relatively shorter, less slender (lateral view), and broader (ventral view) ventral process of the aedeagus. Regarding its antennal morphology, the shape of the pronotum, and the general punctation pattern, *Z. inexcisus* is similar to *Z. hauserianus*, a species described based on one female from the Tian Shan in the extreme northwest of China. For remarks on distinguishing characters see the comment in the section on *Z. hauserianus*. For characters separating *Z. inexcisus* from the similar *Z. illecebrosus* see the section on that species.

Distribution and natural history

The species is currently known from several localities in the Chinese provinces Qinghai and Gansu, as well as from East Siberia and the Russian Far East. The specimens from China were sifted from leaf litter and moss and collected with pitfall traps baited with vinegar in mixed forests. The altitudes range from approximately 2240 to 2700 m.

Zyras (Zyras) granapicalis **n. sp.**

(Figs. 39, 78, 134, 211–212, 301)

Type material

Holotype ♂ [somewhat damaged: left elytron, right hindleg, left mid- and hindlegs missing]: "Ch – S Sichuan, 7.VII.1998, 27.38N, 102.48E, 10 km SW Butuo, cultural steppe, Jaroslav Turna leg. / Holotypus ♂ *Zyras granapicalis* sp. n. det. V. Assing 2014" (cAss).

Paratype ♀ [hindlegs missing]: "Ch – S Sichuan, 28.–29.VI.1998, 27.45N, 101.13E, pass 20 km S Muli (Bowa), mixed forest, ca 3500 m, Jaroslav Turna leg." (cAss).

Etymology

The specific epithet is composed of the Latin noun granum and the Latin adjective apicalis It alludes to the granulose punctation of tergite VIII.

Description

Body length 6.1–7.1 mm; length of forebody 2.8–3.1 mm. Coloration: head and pronotum blackish; elytra yellowish, with the postero-lateral portions sharply and

extensively blackish, black markings not reaching suture (Fig. 78); abdomen (Fig. 134) black, with the posterior margins of segments III–VI narrowly and posterior margin of segment VII slightly more broadly yellowish; legs and maxillary palpi yellowish; antennae (Fig. 39) dark-brown, with antennomeres I–II, base of III, and XI dark-reddish.

Head (Fig. 78) distinctly transverse, broadly impunctate along middle; punctation in lateral dorsal portions very sparse; interstices much broader than diameter of punctures. Eyes distinctly longer than postocular region in dorsal view. Antenna (Fig. 39) 2.1–2.3 mm long and moderately massive; antennomeres IV–X weakly transverse; XI slightly shorter than the combined length of IX and X.

Pronotum (Fig. 78) 1.1–1.2 times as broad as long and 1.28–1.30 times as broad as head; punctation rather fine and sparse; interstices broader than diameter of punctures; midline moderately broadly impunctate.

Elytra (Fig. 78) approximately 0.8 times as long as pronotum; punctation similar to that of pronotum, interstices distinctly broader than diameter of punctures. Hind wings fully developed.

Abdomen (Fig. 134) approximately as broad as elytra, with rather shallow anterior impressions on tergites III–V; anterior impressions of tergites III–V and anterior portion of tergite VI impunctate; posterior margins of tergites III–VI each with a row rather dense setiferous punctures bearing yellowish setae; discs of tergites III–VI with a median pair of punctures in posterior portion and with very few lateral punctures, otherwise impunctate; tergite VII with few fine punctures anteriorly and with very sparse punctures arranged in irregular transverse rows in posterior portion; tergite VIII with granulose punctures in posterior portion; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe.

♂: posterior margin of tergite VIII with a distinct concavity in the middle; sternite VIII somewhat longer than tergite VIII, its posterior margin convex; median lobe of aedeagus nearly 0.9 mm long and shaped as in Figs. 211–212.

♀: tergite VIII similar to that of male, but with less pronounced posterior concavity.

Comparative notes

In size, coloration, and punctation, *Z. granapicalis* is most similar to *Z. birmanus* and *Z. lativentris*, from which it is distinguished particularly by the pale setae at the posterior margins of tergites III–VI (dark in *Z. birmanus* and *Z. lativentris*), by the distinctly granulose punctation in the posterior portion of tergite VIII, as well as by the differently shaped aedeagus.

Distribution and natural history

The specimens were collected in two localities in southern Sichuan (Fig. 301), one in dry arable land and one in a mixed forest at an altitude of approximately 3500 m.

Zyras (Zyras) lativentris **n. sp.**

(Figs. 40, 79, 135, 213–214, 301)

Type material

Holotype ♂ [slightly teneral]: "China: Yunnan, Baoshan Pref., mount. range 25 km S Tengchong, 1900 m, 24°48′21″N, 98°32′05″E, cleft with devast. primary forest, litter & mushr. sifted, 30.VIII.2009, leg. M. Schülke [CHG09-18] / Holotypus ♂ *Zyras lativentris* sp. n. det. V. Assing 2014" (cAss).

Etymology

The specific epithet (Latin, adjective) alludes to the relatively broad abdomen.

Description

Body length 6.1 mm; length of forebody 2.8 mm. Coloration: head and pronotum blackish-brown; elytra yellowish, with the postero-lateral portions extensively blackish (Fig. 79); abdomen (Fig. 135) blackish-brown, with the posterior margins of tergites III–VIII and the paratergites dark-yellowish; legs and maxillary palpi yellowish; antennae (Fig. 40) dark-brown, with antennomeres I–II and base of III reddish-yellow, and XI dark-reddish.

Head (Fig. 79) distinctly transverse, broadly impunctate along middle; punctation in lateral dorsal portions very sparse; interstices much broader than diameter of punctures. Eyes distinctly longer than postocular region in dorsal view. Antenna (Fig. 40) 2.2 mm long and moderately massive; antennomere IV as long as broad; V–X gradually and weakly increasing in width; X rather weakly transverse; XI slightly shorter than the combined length of IX and X.

Pronotum (Fig. 79) large and rather strongly transverse, approximately 1.25 times as broad as long and 1.4 times as broad as head; punctation similar to that of head; interstices much broader than diameter of punctures; midline narrowly impunctate; lateral margins with few long setae.

Elytra (Fig. 79) 0.79 times as long as pronotum; punctation similar to that of pronotum, interstices distinctly broader than diameter of punctures. Hind wings fully developed. Metatarsomere I approximately as long as the combined length of II–IV.

Abdomen (Fig. 135) approximately as broad as elytra, with rather shallow anterior impressions on tergites III–V; anterior impressions of tergites III–V with few scattered non-setiferous punctures; tergites IV–VI with row of moderately numerous setiferous punctures at posterior margin; tergites III–V with a pair of setiferous punctures on disc and laterally with few scattered punctures, otherwise impunctate; tergite VI with a transverse row of 8 setiferous punctures on disc; tergite VII with moderately sparse setiferous punctures not arranged in distinct rows; tergite VIII with moderately dense setiferous punctures posteriorly; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe.

♂: posterior margin of tergite VIII very weakly concave in the middle; sternite VIII somewhat longer than tergite VIII, its posterior margin weakly convex in the middle; median lobe of aedeagus 0.73 mm long and shaped as in Figs. 213–214.

♀: unknown.

Comparative notes

Among the species with a similar coloration pattern and of similar size, *Z. lativentris* is characterized by the sparse punctation of the forebody, the punctation pattern of the abdomen, as well as particularly by the robust habitus (broad pronotum and abdomen) and by the morphology of the aedeagus.

Distribution and natural history

The type locality is situated in a mountain range to the south of Tengchong, western Yunnan (Fig. 301). The holotype was sifted from leaf litter in a degraded primary forest at an altitude of 1900 m.

Zyras (Zyras) caloderoides **n. sp.**
(Figs. 41, 71, 128, 215–216, 302)

Type material

Holotype ♂: "China [4] – Yunnan, NE Kunming, 25°09′07″N, 102°53′46″E, 2280 m, sec. pine for. with alder 11.VIII.2014, V. Assing / Holotypus ♂ *Zyras caloderoides* sp. n. det. V. Assing 2015" (cAss).

Paratypes: 1 ♀: same data as holotype (cAss); 1 ♀: same data, but leg. Schülke (cSch); 1 ♀: "China [2a] – Yunnan, mts NE Dongchuan, 2670 m, 26°14′10″N, 103°12′31″E, bushes, 9.VIII.2014, V. Assing" (cAss); 1 ♂, 2 ♀♀: "China [9b] – Yunnan, mt. W Xundian, 2300 m mixed for., 25°34′58″N, 103°08′42″E, sifted 16.VIII.2014, V. Assing" (cAss); 1 ♂, 1 ♀: "China [10] – Yunnan, mt. NW Wuding, mixed forest, 25°36′53″N, 102°18′59″E, 2190 m, 17.VIII.2014, V. Assing" (cAss); 2 ♀♀: "China: Yunnan, mountain WNW Wuding, 25°38′45″N, 102°06′55″E, 2390 m, mixed forest margin with alder and pine, litter sifted, 1.IX.2014, Schülke [CH14-12a]" (cSch); 1 ♂: "China: Yunnan, NE Kunming, 25°08′35″N, 102°53′49″E, 2320 m, mixed forest with alder, oak, and pine, litter and mushrooms sifted, 13.VIII.2014, Schülke [CH14-06]" (cAss).

Etymology

The specific epithet (adjective) alludes to the morphology of the antennae, which somewhat resemble those of some species of the genus *Calodera* Mannerheim, 1830.

Description

Body length 6.0–7.0 mm; length of forebody 2.6–3.1 mm. Coloration: head and pronotum blackish; elytra yellowish, with the postero-lateral angles extensively blackish (Fig. 71); abdomen (Fig. 128) blackish, with the posterior margins of the segments very narrowly dark-reddish; legs pale-yellowish; antennae (Fig. 41) blackish, with antennomeres I–II reddish to blackish-brown and XI reddish to reddish-brown; maxillary palpi brown to dark-brown, with the terminal palpomere reddish-yellow.

Head (Fig. 71) distinctly transverse, moderately broadly impunctate along middle; punctation in lateral dorsal portions moderately dense and moderately coarse. Eyes slightly longer than postocular region in dorsal view. Antenna (Fig. 41) 1.9–2.2 mm long; antennomere IV weakly transverse; antennomeres V–X gradually increasing in width and increasingly transverse; X slightly less than 1.5 times as broad as long; XI approximately as long as the combined length of IX and X.

Pronotum (Fig. 71) distinctly transverse, 1.20–1.24 times as broad as long and approximately 1.3 times as broad as head; punctation moderately coarse and moderately dense, more or less equally distributed; interstices as broad as, or slightly broader than diameter of punctures; midline narrowly impunctate; lateral and anterior margins without conspicuous long setae.

Elytra (Fig. 71) approximately 0.8 times as long as pronotum; punctation rather coarse and dense, somewhat sparser in postero-sutural portion. Hind wings fully developed. Metatarsomere I approximately as long as the combined length of II–IV.

Abdomen (Fig. 128) as broad as, or slightly narrower than elytra, with rather shallow anterior impressions on tergites III–V; anterior impressions of tergites III–IV practically impunctate, that of tergite V with scattered fine non-setiferous punctures; disc of tergite III with a median pair of punctures near posterior margin, with a lateral puncture and with a lateral marginal puncture on either side; tergites IV and V with a median pair of punctures, with a lateral puncture on either side, and with six punctures at posterior margin; tergite VI with a transverse band of rather fine non-setiferous punctures near anterior margin, with an irregular transverse row of 6–8 punctures, and with approximately 10 punctures at posterior margin; tergite VII with a transverse band of dense, rather fine non-setiferous punctures anteriorly, with two transverse rows of punctures in posterior portion, and with a variable number of additional sparse punctures posteriorly; tergite VIII in posterior portion with asperate setiferous punctation; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe; posterior margin of tergite VIII with shallow median concavity.

♂: sternite VIII somewhat longer than tergite VIII, its posterior margin strongly convex; median lobe of aedeagus 0.87–0.93 mm long and shaped as in Figs. 215–216.

Comparative notes

Among the species with the *Z. shaanxiensis* coloration pattern and of similar size, *Z. caloderoides* is characterized by the combination of rather massive antennae with at

least slightly transverse antennomeres IV–X, equally distributed punctation on the pronotum, rather coarse punctation of the elytra, a blackish abdomen with a distinctive punctation pattern, asperate punctation in the posterior portion of tergite VIII, and a rather large median lobe of the aedeagus with a long ventral process. The species is distinguished from the similar *Z. shaanxiensis* by the shorter and more distinctly incrassate antennae with more transverse antennomeres IV–X, by the sparser punctation of the forebody, and by the more slender apex of the ventral process of the aedeagus.

Distribution and natural history

The known distribution is confined to several localities in East Yunnan (Fig. 302). The specimens were sifted from leaf litter in various mixed forests and in bush habitats at altitudes of 2190–2670 m, in one locality together with *Z. gilvipalpis*.

Zyras (Zyras) gilvipalpis **n. sp.**
(Figs. 7, 72, 122, 217–218, 303)

Type material

Holotype ♂: "China [6] – Yunnan, NE Kunming, 25°08′35″N, 102°53′49″E, 2320 m, mixed forest, sifted, 13.VIII.2014, V. Assing / Holotypus ♂ *Zyras gilvipalpis* sp. n. det. V. Assing 2015" (cAss).

Paratypes: 3 ♂♂, 2 ♀♀: "China [11] – Yunnan, Wuding, Lion Mountain, 2200 m, 25°31′59″N, 102°22′36″E, sifted, 17.VIII.2014, V. Assing" (cAss).

Etymology

The specific epithet (adjective) alludes to the yellowish maxillary palpi, one of the characters distinguishing this species from the similar and sympatric *Z. caloderoides*.

Description

Rather large species; body length 7.0–8.0 mm; length of forebody 3.2–3.5 mm. Coloration: head and pronotum blackish; elytra reddish-yellow, with the postero-lateral angles extensively blackish (Fig. 72); abdomen (Fig. 122) blackish, with the paratergites and the posterior margins of segments III–VI narrowly, those of segments VII and VIII more broadly reddish; legs and maxillary palpi yellowish; antennae (Fig. 7) dark-brown, with the basal 2–3 antennomeres pale-reddish and antennomere XI reddish to dark-reddish.

Head (Fig. 72) distinctly transverse, usually broadly impunctate along middle; punctation in lateral dorsal portions moderately dense and rather fine. Eyes slightly longer than postocular region in dorsal view. Antenna (Fig. 7) rather massive and 2.5–2.7 mm long; antennomeres IV–VII as long as broad or weakly oblong, VIII–X very weakly transverse, X much less than 1.5 times as broad as long, and XI approximately as long as the combined length of IX and X.

Pronotum (Fig. 72) rather large in relation to head, distinctly transverse, 1.15–1.20 times as broad as long, and approximately 1.4 times as broad as head; punctation rather fine and rather dense, more or less equally distributed; interstices on average approximately as broad as diameter of punctures; midline narrowly impunctate; lateral and anterior margins without conspicuous long setae.

Elytra (Fig. 72) 0.75–0.80 times as long as pronotum; punctation dense and not very coarse, slightly sparser in postero-sutural portion. Hind wings fully developed. Metatarsomere I approximately as long as the combined length of II–IV.

Abdomen (Fig. 122) approximately as broad as elytra or nearly so, with rather shallow anterior impressions on tergites III–V; anterior impressions of tergites III–IV with sparse and fine non-setiferous punctures, that of tergite V with more numerous fine non-setiferous punctures; disc of tergite III with a lateral puncture on either side and with four punctures at posterior margin; tergite IV with a lateral marginal puncture on either side, with a median pair of punctures, and with usually four punctures at posterior margin; tergite V with a lateral puncture on either side, with a median pair of punctures, and with more numerous punctures at posterior margin; tergite VI with a transverse band of numerous non-setiferous punctures near anterior margin, with a lateral puncture on either side, with a median pair of punctures, and with approximately 10 punctures at posterior margin; tergite VII with a transverse band of dense, rather fine punctures anteriorly and with numerous punctures not arranged in distinct series in posterior portion; tergite VIII in posterior portion with punctation bearing long black setae; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe; posterior margin of tergite VIII truncate or weakly concave in the middle.

♂: sternite VIII somewhat longer than tergite VIII, its posterior margin strongly convex; median lobe of aedeagus 1.00–1.05 mm long and shaped as in Figs. 217–218.

Comparative notes

Among the species with the *Z. shaanxiensis* coloration pattern, *Z. gilvipalpis* is characterized by the combination of rather large body size, long and massive antennae with weakly transverse preapical antennomeres, rather fine punctation on the head and pronotum, equally distributed punctation on the pronotum, dense punctation of the elytra, a blackish abdomen with a distinctive punctation pattern, and a rather large median lobe of the aedeagus. It is distinguished from the similar sympatric and syntopic *Z. caloderoides* by larger body size, much longer antennae with distinctly less transverse preapical antennomeres, a larger pronotum (in relation to the head), finer punctation

of the pronotum, finer and denser punctation of the elytra, the punctation pattern of the abdomen (particularly the more numerous non-setiferous punctures in the anterior impressions of tergites III–V), the simple (non-asperate) punctation on tergite VIII, and by the distinctly larger median lobe of the aedeagus with a relatively shorter and stouter ventral process. This species differs from the similar *Z. shaanxiensis* by the longer antennae with oblong or less transverse antennomeres IV–X and a distinctly longer antennomere XI, the relatively larger and more transverse pronotum, the convex posterior margin of the male sternite VIII, and by the morphology of the median lobe of the aedeagus (on the whole larger; ventral process more slender; crista apicalis of different orientation).

Distribution and natural history

Zyras gilvipalpis was collected in two localities to the northeast of Kunming and near Wuding, East Yunnan (Fig. 303). The specimens were sifted from leaf litter in a mixed forest with alder, oak, and pine, together with *Z. caloderoides*, and from moist leaf litter in a stream valley with deciduous forest at altitudes of 2320 and 2200 m, respectively.

Zyras (Zyras) dabanicus **n. sp.**
(Figs. 42, 80, 136, 219–220, 302)

Type material

Holotype ♂: "China (Qinghai Prov.), Daban Shan, 62 km NNW Honggu, 36°51′26.8″N, 102°36′50.2″E, 2275 m (creek valley, *Picea-Populus-Betula* forest, litter sifted), 26. & 29.VI.2011 D. W. Wrase [09E] / Holotypus ♂ *Zyras dabanicus* sp. n. det. V. Assing 2014" (cAss).

Paratypes: 2♂♂ [slightly teneral]: same data as holotype (cSch, cAss); 1♀: "China: Qinghai Prov. [CH11-08b], Daban Shan, 60 km NW Honggu, 36°49′10.7″N, 102°31′22.8″E, 2366–2400 m, mixed forest (*Betula*, *Populus*, *Picea*) mushrooms sifted, 11.VII.2011, leg. M. Schülke" (cSch).

Etymology

The specific epithet (adjective) is derived from the name of the mountain range where the species was discovered.

Description

Relatively small species; body length 5.4–6.0 mm; length of forebody 2.4–2.5 mm. Coloration: head and pronotum blackish; elytra with the anterior half yellowish and the posterior half, except for the yellowish suture, blackish (Fig. 80); abdomen (Fig. 136) blackish-brown to blackish, with the anterior and the posterior margins of the segments yellowish; legs and maxillary palpi yellowish; antennae (Fig. 42) dark-brown, with antennomeres I–III and XI pale-reddish.

Head (Fig. 80) moderately transverse, broadly impunctate along middle; punctation in lateral dorsal portions sparse; interstices broader than diameter of punctures. Eyes slightly longer than postocular region in dorsal view. Antenna (Fig. 42) rather short and distinctly incrassate apically, 1.5–1.7 mm long; antennomeres IV–X all distinctly transverse, gradually and distinctly increasing in width; X more than 1.5 times as broad as long; XI approximately as long as the combined length of IX and X.

Pronotum (Fig. 80) moderately transverse, 1.10–1.15 times as broad as long and approximately 1.3 times as broad as head; punctation relatively fine and moderately sparse; interstices broader than diameter of punctures; midline narrowly impunctate; lateral and anterior margins without long setae.

Elytra (Fig. 80) approximately 0.85 times as long as pronotum; punctation rather fine and moderately sparse, interstices on average slightly to distinctly broader than diameter of punctures. Hind wings fully developed. Metatarsomere I approximately as long as the combined length of II–IV.

Abdomen (Fig. 136) approximately 0.9 times as broad as elytra, with rather shallow anterior impressions on tergites III–V; tergites III–VI, including anterior portions, with moderately sparse and irregular fine punctation, each with a row of dense punctures bearing short yellowish setae at posterior margin; tergite VII with rather dense punctation near anterior margin and moderately sparse punctation on remainder of disc; tergite VIII with moderately sparse to rather dense punctation in posterior half; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe; posterior margin of tergite VIII without sexual dimorphism, with or without shallow median concavity in both sexes.

♂: sternite VIII somewhat longer than tergite VIII, its posterior margin convex; median lobe of aedeagus rather small, approximately 0.65 mm long; ventral process with long apical portion in lateral view (Figs. 119–120).

Comparative notes

Among the species with the *Z. shaanxiensis* coloration pattern and of similar size, *Z. dabanicus* is characterized by the short and apically strongly incrassate antennae with distinctly transverse antennomeres IV–X, the relatively sparse and fine punctation of the forebody, the moderately transverse pronotum, the punctation pattern of the pronotum, as well as by the morphology of the aedeagus. The species additionally differs from the similarly coloured *Z. shaanxiensis* by smaller body size and the posteriorly more extensively blackish elytra (*Z. shaanxiensis*: posterior blackish spots usually not reaching suture and of more triangular shape). It is distinguished from *Z. hauserianus* by the distinctly less transverse and more convex (cross-section) pronotum, and the much sparser punctation of the abdomen (especially of tergites VI and VII).

Distribution and natural history

The species is known from two localities in the Daban Shan, Qinghai province (Fig. 302). The specimens were sifted from leaf litter and mushrooms in mixed forests at altitudes of 2275–2400 m.

Zyras (Zyras) notaticornis Pace, 1998
(Figs. 24, 81, 137, 225–226, 302)

Zyras (Zyras) notaticornis Pace, 1998: 971.

Type material examined

Holotype ♂: "KARC [= Kadoori Agricultural Research Centre] F.I.T., 19–31.V.96 / Holotypus *Zyras notaticornis* m., det. R. Pace 1996 / *Zyras notaticornis* sp. n., det. R. Pace 1996 / *Zyras notaticornis* Pace, det. V. Assing 2015" (MHNG). – Paratype ♀ [heavily damaged; elytra and parts of antennae missing]: "Hong Kong, KARC [= Kadoori Agricultural Research Centre] 31.V.1996, G. de Rougemont / Flight interception trap / Paratypus *Zyras notaticornis* m., det. R. Pace 1996 / *Zyras notaticornis* Pace, det. V. Assing 2015" (cRou).

Additional material examined

China: 1 ♂, Guangxi A. R., Longsheng Hot Spring, 25°53.6′N, 110°12.4′E, 360 m, forested river valley, 11.–14.IV.2013, leg. Fikáček, Hájek & Růžička (NMP); 1 ♂, Guangxi, Diding, 1200 m, 8.VII.1999, leg. Fellowes (cAss).

Hong Kong: 1 ♀, Hong Kong, III–IV.1997, leg. Rougemont (cRou).

Comment

The original description is based on a male holotype and four paratypes of unspecified sex from "Hong Kong, Kadoorie Agricultural Research Centre" and a male paratype from "Zhejiang Prov., Anji County, ca. 480 m, Long Wan Shan N. R." (Pace 1998). According to the description, antennomere XI is yellowish and the length of the body is 5.4 mm, whereas in the examined material antennomere XI is pale-reddish to dark-brown and body length is somewhat greater (holotype: 6.0 mm). Note that the illustrations of the median lobe of the aedeagus provided by Pace (1998) are not quite accurate (orientation of the crista apicalis; shape of apex of ventral process in ventral view).

Redescription

Body length 6.0–7.6 mm; length of forebody 2.5–3.0 mm. Forebody conspicuously glossy. Coloration: head and pronotum black; elytra black, with the humeral portions and the suture reddish-yellow (Fig. 81); abdomen (Fig. 137) black, with the posterior margins of the tergites more or less narrowly reddish; legs yellowish; antennae (Fig. 24) black, with antennomere XI pale-reddish to dark-brown; maxillary palpi dark-brown to blackish, with the terminal palpomere yellowish.

Head (Fig. 81) distinctly transverse, broadly impunctate along middle; punctation in lateral dorsal portions rather coarse and rather sparse. Eyes slightly longer than postocular region in dorsal view. Antenna (Fig. 24) 2.3–2.4 mm long; antennomere IV weakly oblong; antennomeres V–VI weakly oblong or as broad as long; VII approximately as broad as long or weakly transverse, VIII–X weakly transverse, X slightly less than 1.5 times as broad as long, and XI approximately as long as the combined length of IX and X.

Pronotum (Fig. 81) moderately transverse, 1.15–1.18 times as broad as long and 1.24–1.26 times as broad as head; punctation rather coarse, rather sparse, and somewhat irregularly spaced, posterior portion nearly impunctate; interstices broader than diameter of punctures; midline rather broadly impunctate.

Elytra (Fig. 81) approximately 0.85 times as long as pronotum; punctation rather coarse, defined, and dense in anterior portion and rather sparse in posterior portion, interstices in posterior half on average distinctly broader than diameter of punctures. Hind wings fully developed. Metatarsomere I approximately as long as the combined length of II–IV.

Abdomen (Fig. 137) nearly as broad as elytra, with rather shallow anterior impressions on tergites III–V; anterior impressions of tergites III–V and anterior portion of tergite VI with a row of rather ill-defined and not very coarse non-setiferous punctures; tergite III with a pair of median punctures, and with a lateral and a latero-marginal puncture on either side; tergite IV with a pair of median punctures, with a lateral puncture on either side, and with four punctures at posterior margin; tergites V–VI with a pair of median punctures, with a lateral puncture on either side, and with approximately 8 punctures at posterior margin; tergite VII with few scattered non-setiferous punctures in anterior portion and with two irregular transverse series of sparse setiferous punctures in posterior portion; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe; posterior margin of tergite VIII with distinct median concavity.

♂: sternite VIII somewhat longer than tergite VIII, its posterior margin convex; median lobe of aedeagus (Figs. 225–226) 0.73–0.83 mm long; ventral process apically slender, straight, and acute in lateral view.

Comparative notes

This species is distinguished from other Chinese representatives of the subgenus with a similar coloration pattern particularly by the conspicuously glossy body, the rather coarse punctation of the pronotum and elytra, the punctation pattern of the abdomen, and by the shape of the median lobe of the aedeagus.

Distribution and natural history

Zyras notaticornis is currently known from Hong Kong and the Chinese provinces Guangxi and Zhejiang

(Fig. 302). The low altitudes (200–1200 m), at which the species was collected, suggest that it may widespread in South China. The type material was caught with flight interception traps (ROUGEMONT 2001).

Zyras (Zyras) seminigerrimus Bernhauer, 1933
(Figs. 44, 82, 138, 236–237, 302)

Zyras (Zyras) seminigerrimus BERNHAUER, 1933b: 54.

Type material examined

Lectotype ♂ [dissected prior to present study], present designation: "Tatsienlu, China / –Kiulung, REITTER / *seminigerrimus* Bernh. Typ. un. / *seminigerrimus* Brnh. Typus un., don. EMM. REITTER / Chicago NHMus, M.BERNHAUER Collection / *Zyras (Zyras) seminigerrimus* / Lectotypus ♂ *Zyras seminigerrimus* Bernhauer, desig. V. ASSING 2015 / *Zyras seminigerrimus* Bernhauer, det. V. ASSING 2015" (FMNH).

Comment

The original description is based on an unspecified number of syntypes from "Tatsienlu [=Kangding]–Kiulung" (BERNHAUER 1933b). The examined syntype is apparently unique, as can be inferred from the labels attached to it. Nevertheless, it is designated as the lectotype. The specimen had been dissected prior to the present study. As a result, the abdominal segments VII–X are nearly completely bleached (pale-yellowish) and damaged. Thus, the redescription of the coloration of these segments had to rely on the original description. Also, it was not possible to assess the original body length; according to BERNHAUER (1933b) it is 5.5 mm, but judging from what is left of the specimen, its total length is between 6.5 and 7.0 mm.

Redescription

Length of forebody 3.0 mm. Coloration: forebody blackish (Fig. 82); abdomen (Fig. 138) with tergites I–II blackish, III–IV pale-reddish, V–VI dark-brown with reddish margins and paratergites, VII bicoloured, reddish in anterior three-fifths and blackish-brown in posterior two-fifths (tergites VIII–X completely bleached; see comment above); legs yellowish; antennae (Fig. 44) blackish-brown with apical portion of antennomere XI only indistinctly paler and antennomeres I–II and base of III reddish-brown; maxillary palpi reddish, with palpomere IV yellowish.

Head (Fig. 82) distinctly transverse, broadly impunctate along middle; punctation in lateral dorsal portions rather coarse and very sparse. Eyes slightly longer than postocular region in dorsal view. Antenna (Fig. 44) 2.2 mm long, moderately slender, and moderately massive; antennomeres IV–V approximately as broad as long, VI–X of gradually increasing width and increasingly transverse; X approximately 1.5 times as broad as long; XI approximately as long as the combined length of IX and X.

Pronotum (Fig. 82) moderately transverse, 1.16 times as broad as long and 1.32 times as broad as head; punctation very sparse and irregularly spaced, antero-lateral and posterior portions of disc nearly impunctate; midline narrowly impunctate.

Elytra (Fig. 82) 0.82 times as long as pronotum; punctation moderately coarse, moderately dense anteriorly and very sparse posteriorly, disc in postero-lateral portion extensively nearly impunctate. Hind wings fully developed. Metatarsomere I approximately as long as the combined length of II–IV.

Abdomen (Fig. 138) slightly narrower than elytra, with moderately deep anterior impressions on tergites III–V; anterior impressions of tergites III–V with a row of non-setiferous punctures not reaching lateral margins; tergite III with a median pair of punctures in posterior portion, and with a lateral puncture and a postero-lateral puncture on either side; tergite IV with a lateral puncture on either side and with four punctures at posterior margin; tergite V with a lateral puncture on either side and with six punctures at posterior margin; tergite VI with rather dense non-setiferous punctation anteriorly, with a lateral puncture on either side, and with 8 punctures at posterior margin (posterior segments damaged in lectotype).

♂: median lobe of aedeagus 0.9 mm long and shaped as in Figs. 236–237; apical lobe of paramere moderately long and slender.

Comparative notes

Zyras seminigerrimus is characterized particularly by the coloration pattern of the body, the sparse and irregularly spaced punctation of the pronotum and the elytra, the punctation pattern of the abdomen, and the shape of the median lobe of the aedeagus.

Distribution and natural history

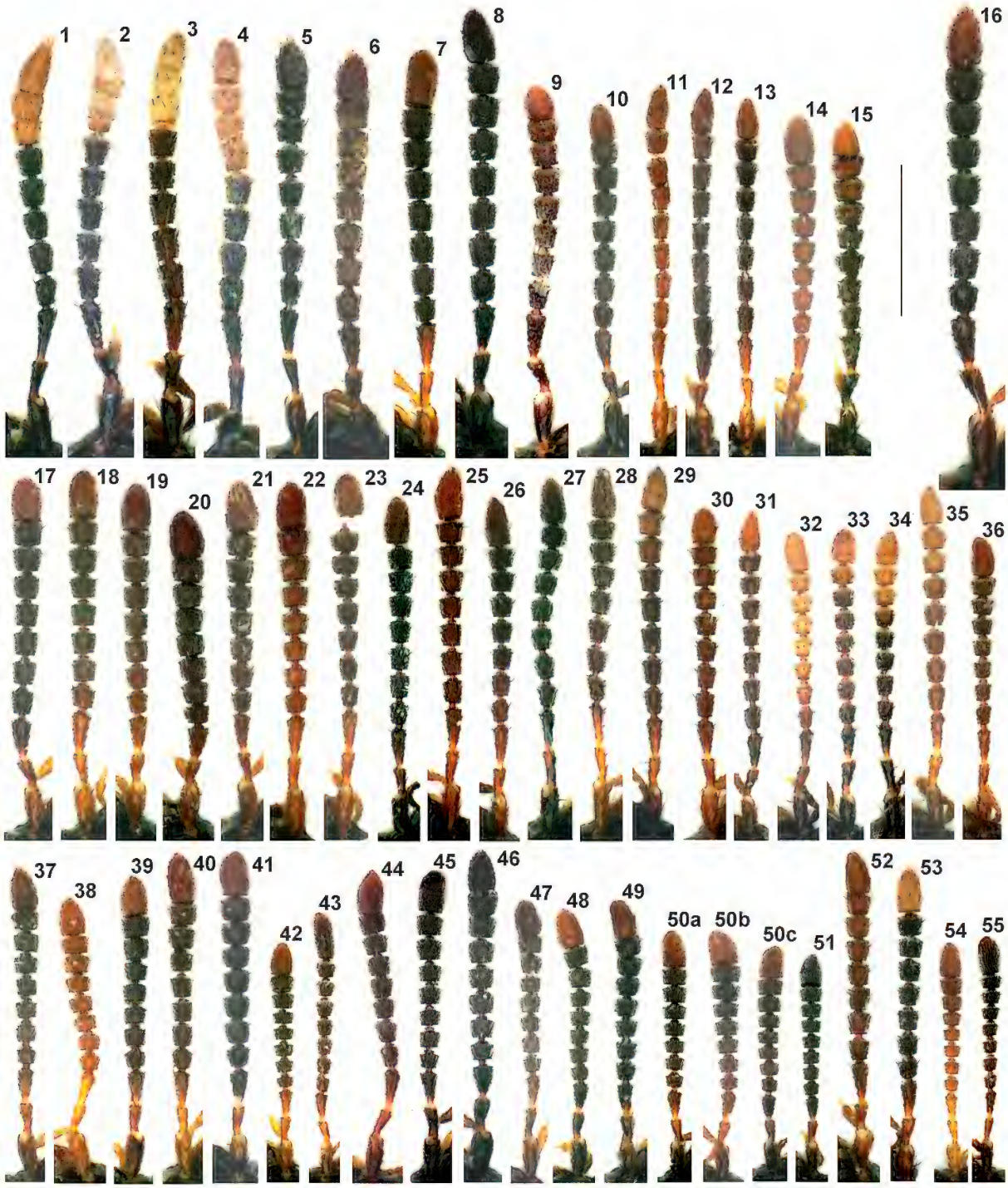
Zyras seminigerrimus is currently known only from the type locality near Kangding in the Chinese province Sichuan (Fig. 302). Additional data are not available.

Zyras (Zyras) maculicollis **n. sp.**
(Figs. 25, 83, 141, 221–222, 305)

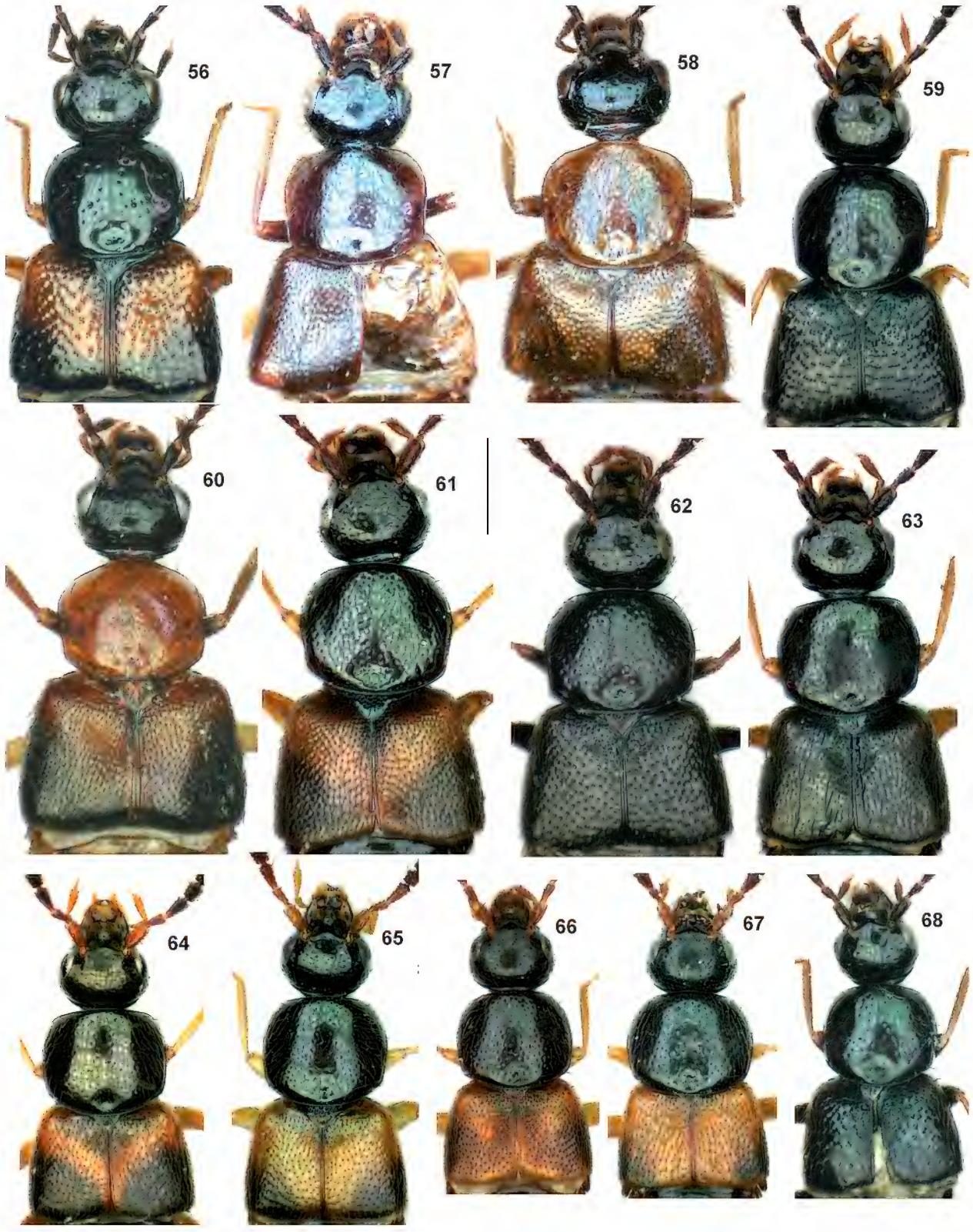
Type material

Holotype ♂: "China (W-Hubei) Daba Shan, creek vall. 11 km NW Muyuping, 31°30′N, 110°22′E, 1960 m (creek vall., mix. decid. for., moss, leaves-sift.) 18.VII.2001 WRASE [17] / Holotypus ♂ *Zyras maculicollis* sp. n. det. V. ASSING 2014" (cAss).

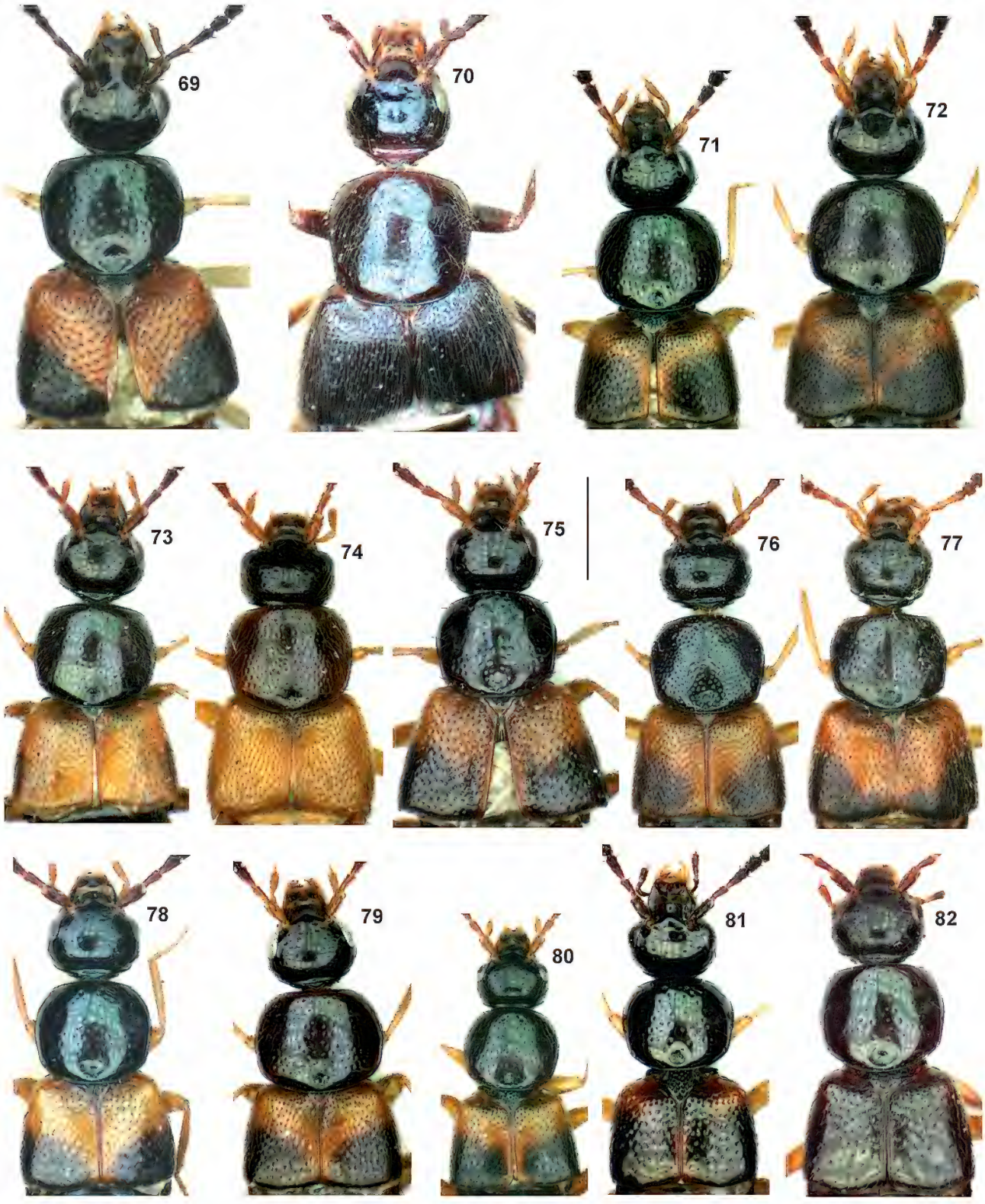
Paratypes: 1 ♀: "China: W-Hubei (Daba Shan), creek valley 8 km NW Muyuping, 31°29′N, 110°22′E, 1550–1650 m, 18.VII.2001, leg. M. SCHÜLKE [C01-16A] / creek valley, deciduous forest, moss (sifted) [C01-16A]" (cSch); 1 ♀: "China: Jiangxi prov., Wuyi Shan Nat. Res., Huangganshan [sic], (1800–2050 m), 5.VI.2001, HLAVÁČ & COOTER lgt." (cHla).



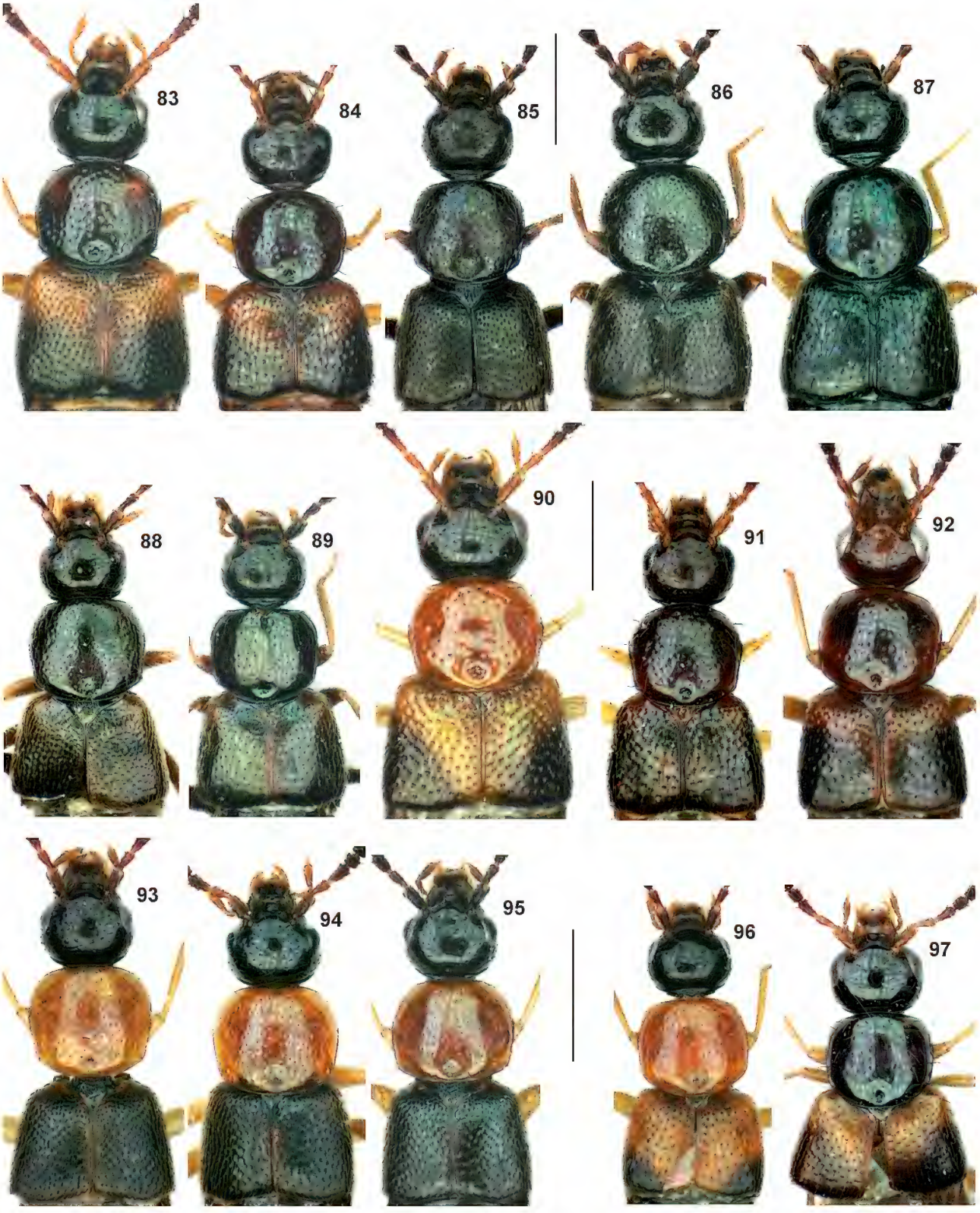
Figs. 1–55. Antennae of *Zyras* spp. – **1**. *malaisei* (paratype). **2**. *chinkiangensis* (lectotype). **3**. *alboantennatus*. **4**. *setosipennis*, holotype. **5**. *kambaitiensis*. **6**. *rufapicalis*. 7. *gilvipalpis*. **8**. *nigricornis*. **9**. *setosivestis*, holotype. **10**. *iniquus*. **11**. *glabricollis* (holotype). **12**. *extensus*. **13**. *rectus*. **14**. *sibiricus* (Hokkaido). **15**. *flexus*. **16**. *rufoterminalis*. **17**. *birmanus*. **18**. *shaanxiensis*. **19**. *wei* (Fujian). **20**. *firmicornis*. **21**. *subobsoletus*. **22**. *sibiricus* (Beijing). **23**. *bangmaicus*. **24**. *notaticornis*. **25**. *maculicollis*. **26**. *tenuicornis*. **27**. *nigrapicalis*. **28**. *schuelkei*. **29**. *bisinuatus*. **30**. *formosanus*. **31**. *exspoliatus*. **32**. *song*, holotype. **33**. *hongkongensis* (Guangxi). **34**. *articollis*. **35**. *geminus* (paralectotype). **36**. *hebes*. **37**. *inexcisus*. **38**. *hauserianus* (holotype). **39**. *granapicalis*. **40**. *lativentris*. **41**. *caloderoides*. **42**. *dabanicus*. **43**. *fratrumkadooriorum*, paratype. **44**. *seminigerrimus* (lectotype). **45**. *tenebricosus*. **46**. *tumidicornis*. **47**. *athetoides*. **48**. *atronitens*. **49**. *nigronitens*. **50**. *beijingensis* (50a: Gansu; 50b: holotype of *restitutus*; 50c: Zhejiang). **51**. *pulcher*. **52**. *discolor*. **53**. *bicoloricollis*. **54**. *songanus*. **55**. *volans*. – Scale bar: 1.0 mm.



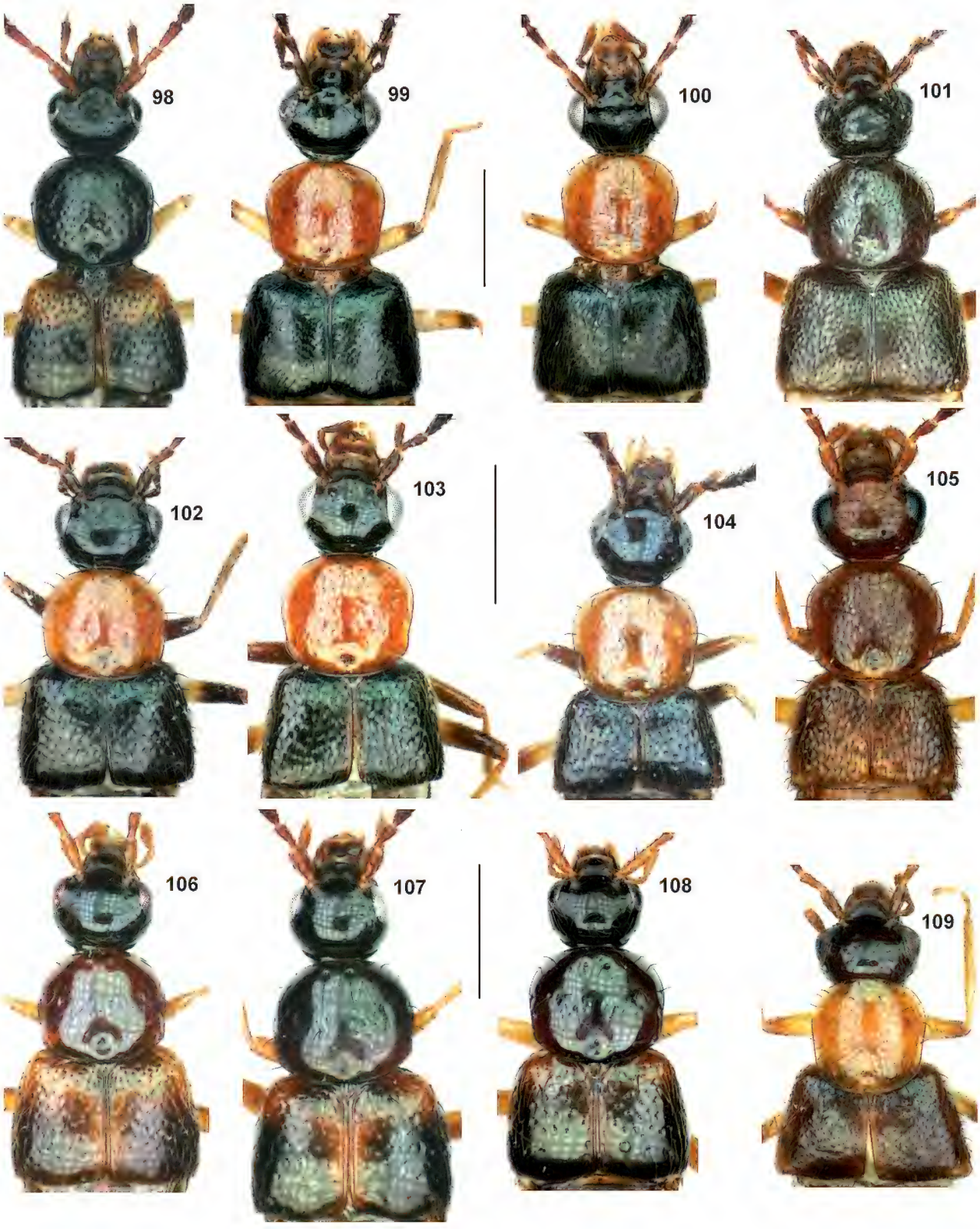
Figs. 56–68. Forebodies of *Zyras* spp. – **56**. *malaisei* (paratype). **57**. *chinkiangensis* (lectotype). **58**. *setosipennis* (holotype). **59**. *kambaitiensis*. **60**. *alboantennatus*. **61**. *rufoterminalis*. **62**. *rufapicalis*. **63**. *nigricornis*. **64**. *birmanus*. **65**. *shaanxiensis*. **66**. *wei* (Fujian). **67**. *firmicornis*. **68**. *iniquus*. – Scale bar: 1.0 mm.



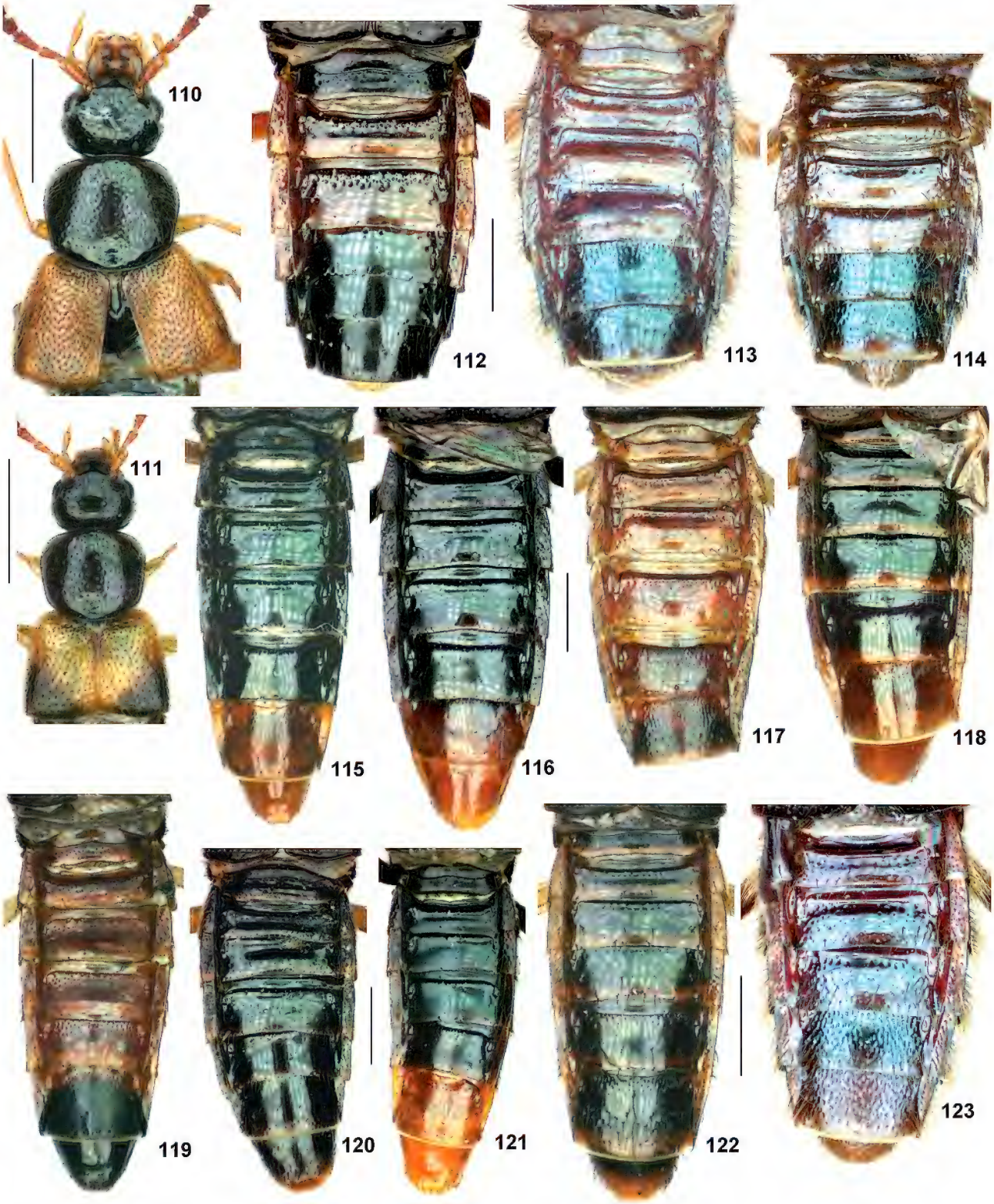
Figs. 69–82. Forebodies of *Zyras* spp. – **69**. *nigrapicalis*. **70**. *setosivestis* (holotype). **71**. *caloderoides*. **72**. *gilvipalpis*. **73**. *subobsoletus*. **74**. *sibiricus* (Beijing). **75**. *bangmaicus*. **76**. *inexcisus*. **77**. *hauserianus* (holotype). **78**. *granapicalis*. **79**. *lativentris*. **80**. *dabanicus*. **81**. *notaticornis*. **82**. *seminigerrimus* (lectotype). – Scale bar: 1.0 mm.



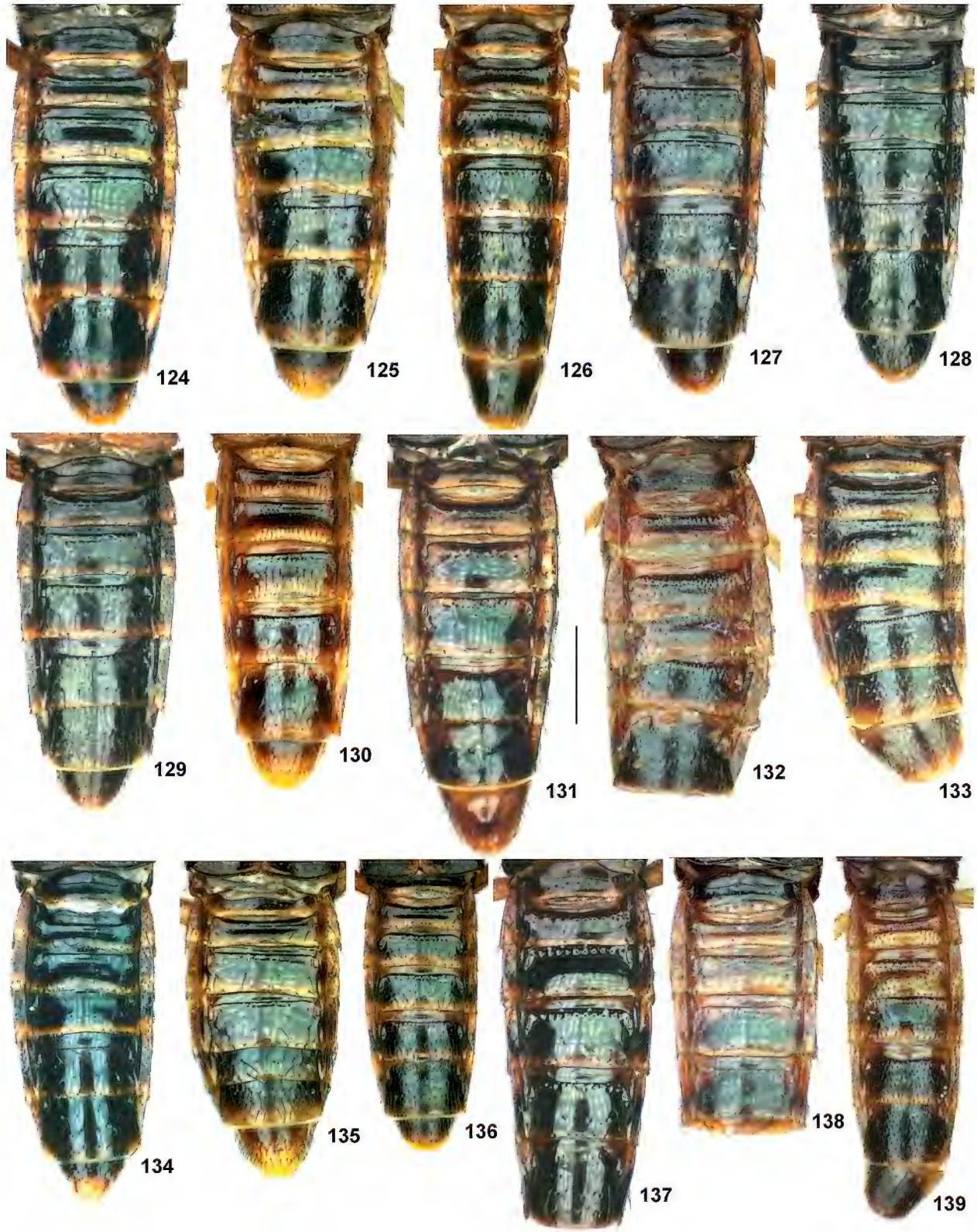
Figs. 83–97. Forebodies of *Zyras* spp. – **83**. *maculicollis*. **84**. *tenuicornis*. **85**. *tenebricosus*. **86**. *tumidicornis*. **87**. *nigronitens*. **88**. *athetoides*. **89**. *atronitens*. **90**. *schuelkei*. **91**. *discolor*. **92**. *bicoloricollis*. **93–95**. *beijingensis* (93: Gansu; 94: holotype of *restitutus*; 95: Zhejiang). **96**. *pulcher*. **97**. *fratrumkadooriorum* (paratype). – Scale bars: 1.0 mm.



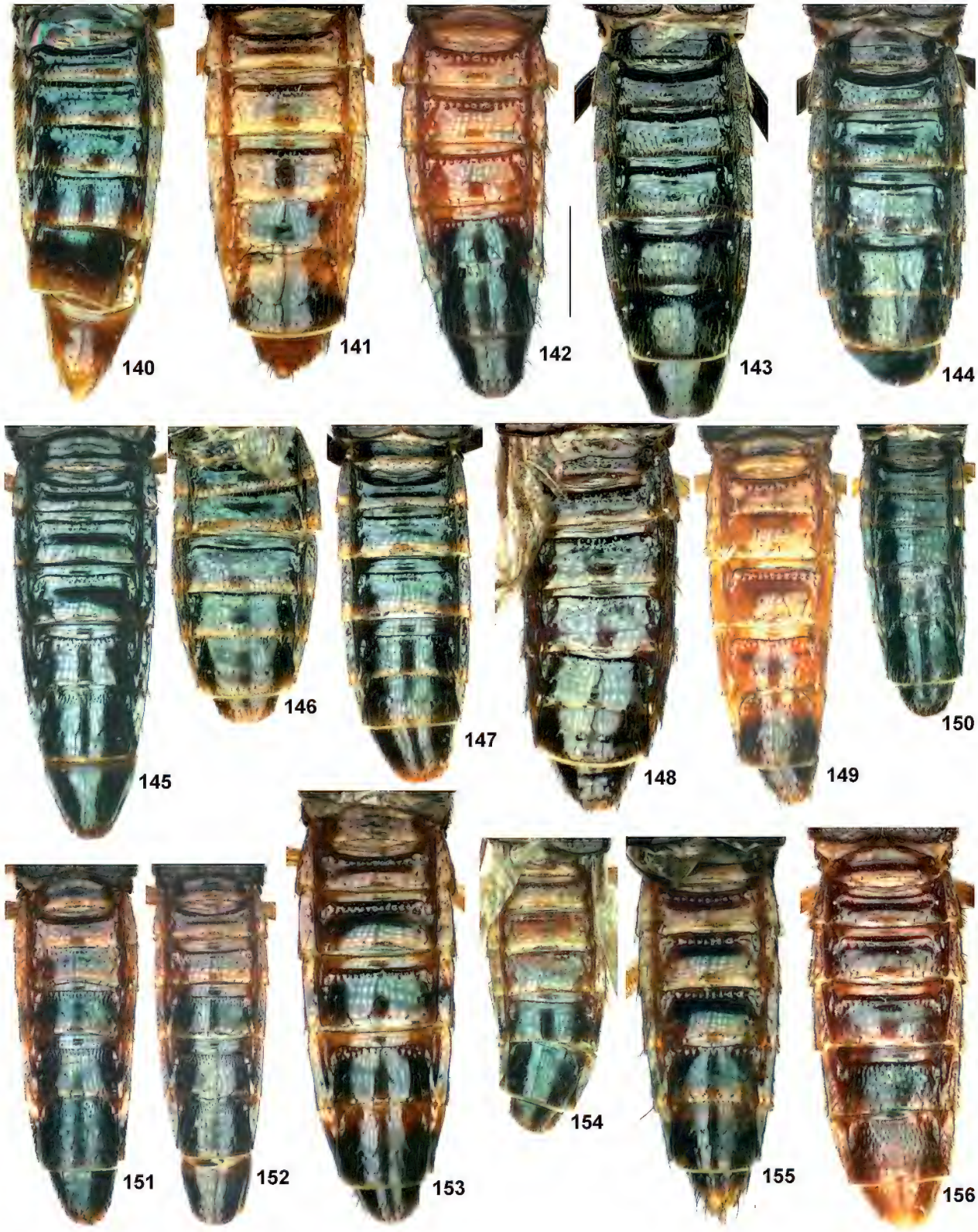
Figs. 98–109. Forebodies of *Zyras* spp. – **98**. *bisinuatus*. **99**. *hongkongensis* (Guangxi). **100**. *articollis*. **101**. *flexus*. **102**. *song* (holotype). **103**. *exspoliatus*. **104**. *yongshengensis* (holotype). **105**. *formosanus*. **106**. *glabricollis* (holotype). **107**. *extensus*. **108**. *rectus*. **109**. *geminus* (paralectotype). – Scale bars: 1.0 mm.



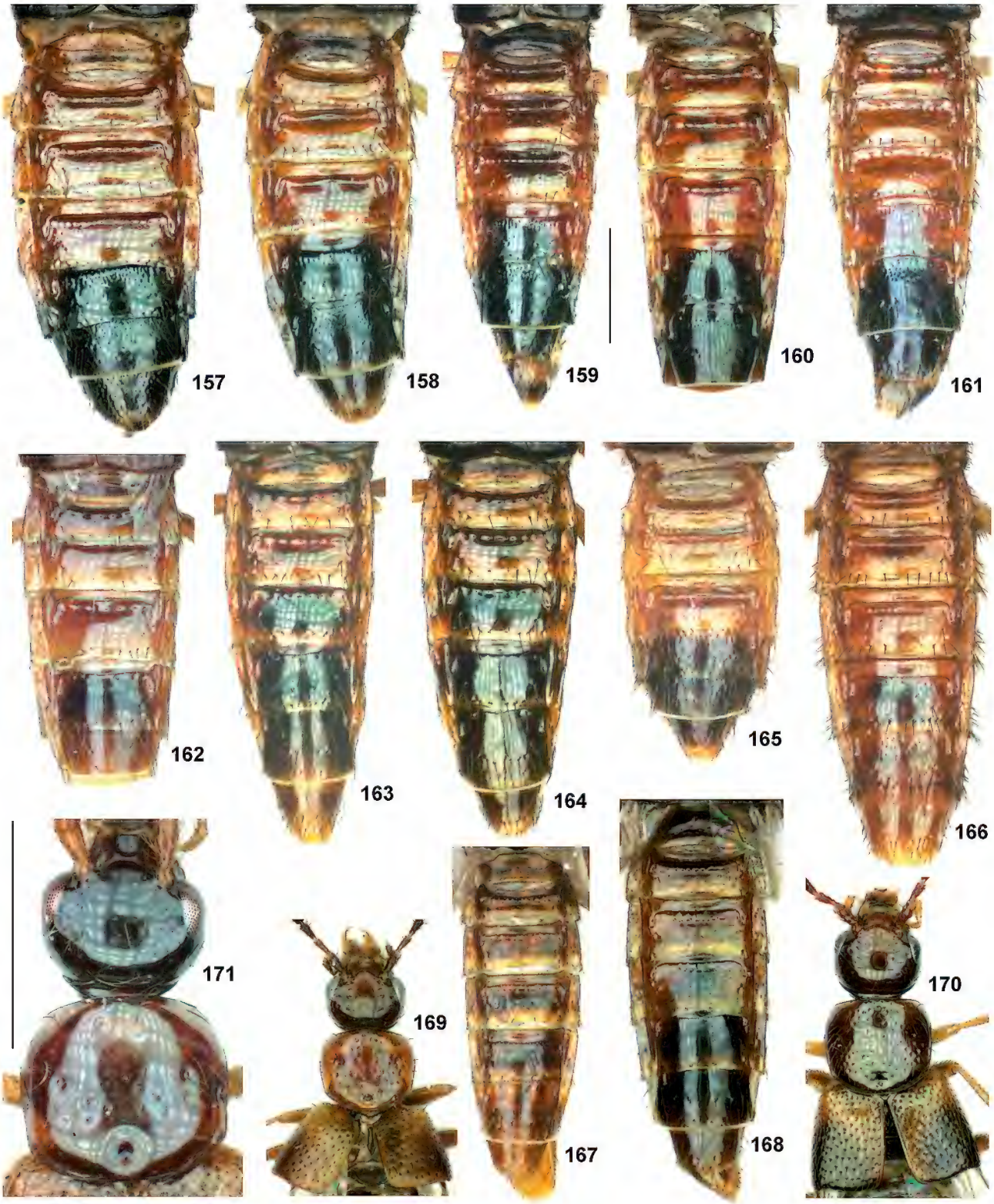
Figs. 110–123. Forebodies (110–111) and abdomina (112–123) of *Zyras* spp. – **110**. *sibiricus* (Hokkaido). **111**. *songanus* (holotype). **112**. *malaisei* (paratype). **113**. *chinkiangensis* (lectotype). **114**. *setosipennis* (holotype). **115**. *kambaitiensis*. **116**. *rufapicalis*. **117**. *alboantennatus*. **118**. *rufoterminalis*. **119**. *nigrapicalis*. **120**. *nigricornis*. **121**. *iniquus*. **122**. *gilvipalpis*. **123**. *setosivestis* (holotype). – Scale bars: 1.0 mm.



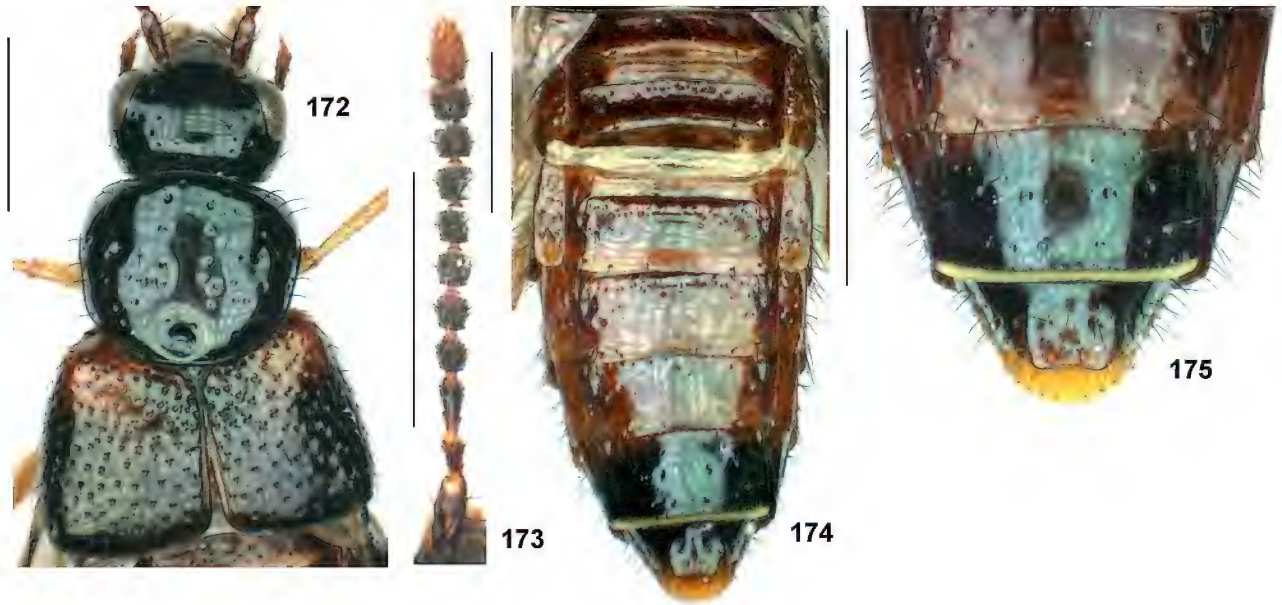
Figs. 124–139. Abdomina of *Zyras* spp. – **124**. *birmanus*. **125**. *shaanxiensis*. **126**. *wei* (Fujian). **127**. *firmicornis*. **128**. *caloderoides*. **129**. *subobsoletus*. **130**. *sibiricus* (Beijing). **131**. *bangmaicus*. **132**. *hauserianus* (holotype). **133**. *inexcisus*. **134**. *granapicalis*. **135**. *lativentris*. **136**. *dabanicus*. **137**. *notaticornis*. **138**. *seminigerrimus* (lectotype). **139**. *songanus* (holotype). – Scale bar: 1.0 mm.



Figs. 140–156. Abdomina of *Zyras* spp. – **140**. *sibiricus* (Hokkaido). **141**. *maculicollis*. **142**. *tenuicornis*. **143**. *tenebricosus*. **144**. *tumidicornis*. **145**. *nigronitens*. **146**. *athetoides*. **147**. *atronitens*. **148**. *schuelkei*. **149**. *discolor*. **150**. *pulcher*. **151–152**. *beijingensis* (151: holotype of *restitutus*; 152: Zhejiang). **153**. *bicoloricollis*. **154**. *fratrumkadooriorum* (paratype). **155**. *bisinuatus*. **156**. *flexus*. – Scale bar: 1.0 mm.



Figs. 157–171. Abdomina (157–168), forebodies (169–170), and head and pronotum (171) of *Zyras* spp. – **157**. *hongkongensis* (Guangxi). **158**. *articollis*. **159**. *song* (holotype). **160**. *exspoliatus*. **161**. *yongshengensis* (holotype). **162**, **171**. *glabricollis* (holotype). **163**. *extensus*. **164**. *rectus*. **165**. *geminus* (paralectotype). **166**. *formosanus*. **167**, **169**. *volans*. **168**, **170**. *hebes*. – Scale bars: 1.0 mm.



Figs. 172–175. *Zyras atrapicalis*. – **172**. Forebody. **173**. Antenna. **174**. Abdomen. **175**. Abdominal segments VI–VIII. – Scale bars: 1.0 mm.

Etymology

The specific epithet (Latin, adjective) alludes to the pair of indistinct anterior reddish spots on the pronotum.

Description

Body length 6.5–7.4 mm; length of forebody 3.0–3.4 mm. Coloration: head blackish brown to blackish; pronotum blackish-brown to blackish, anteriorly with a sometimes nearly obsolete indistinct and diffusely limited reddish spot on either side of middle; elytra yellowish, with extensively blackish postero-lateral portion reaching, but not including, suture, the blackish coloration extending beyond middle anteriorly (Fig. 83); abdomen (Fig. 141) reddish-yellow, with the middle of tergite VI and the posterior third of tergite VII blackish; legs yellowish; antennae (Fig. 25) dark-brown, with antennomeres I, II, and XI reddish.

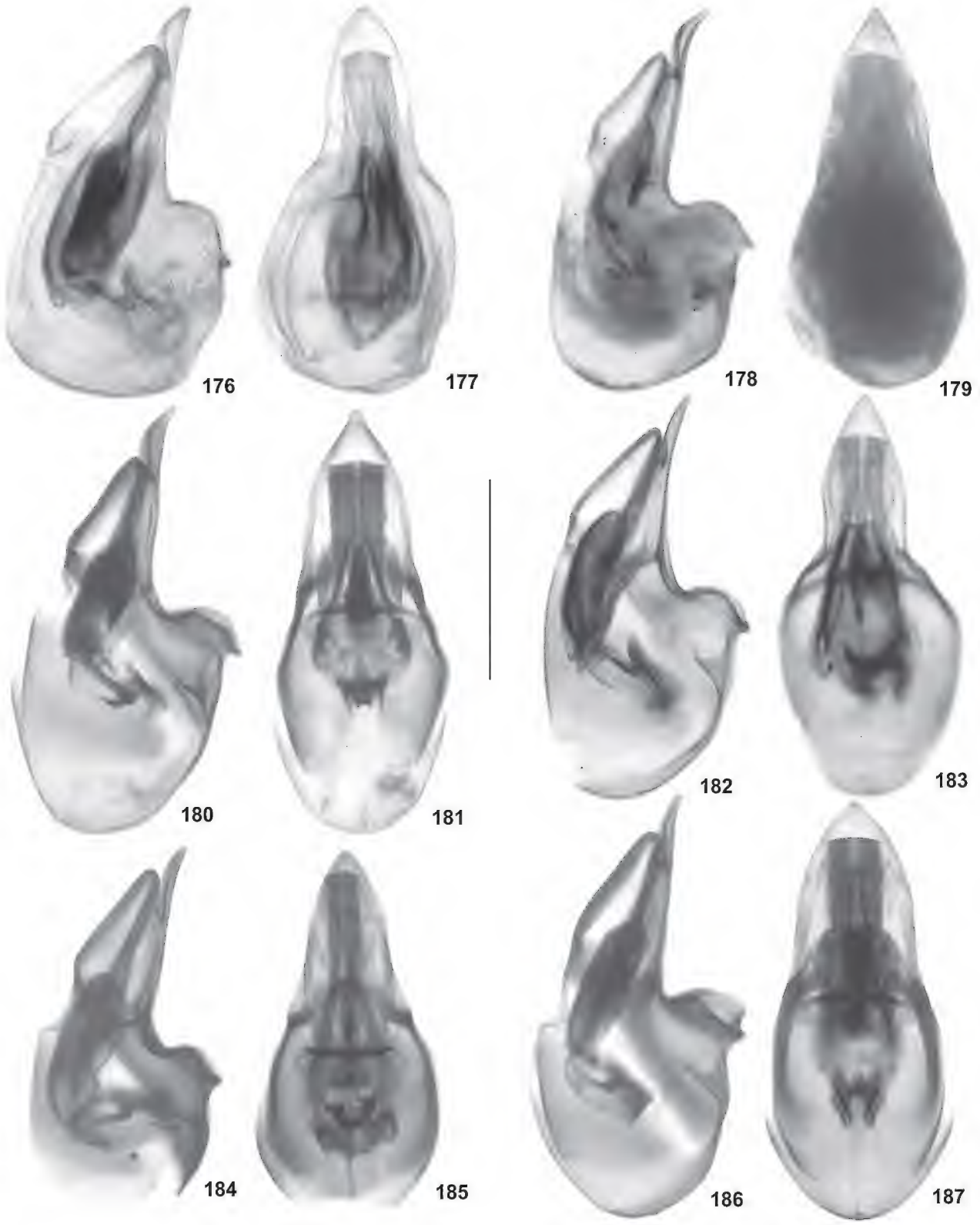
Head (Fig. 83) moderately transverse, broadly impunctate along middle; punctation in lateral dorsal portions sparse; interstices much broader than diameter of punctures. Eyes slightly longer than postocular region in dorsal view. Antenna (Fig. 25) 2.4–2.7 mm long and rather slender; antennomeres IV–V weakly oblong; V approximately as long as broad; VI–X gradually and weakly increasing in width; X approximately 1.5 times as broad as long; XI approximately as long as, or slightly longer than the combined length of IX and X.

Pronotum (Fig. 83) relatively small in relation to head, 1.14–1.15 times as broad as long and 1.20–1.22 times as broad as head, weakly convex in cross-section; punctation irregularly spaced, as coarse as that of head, irregularly spaced, antero-laterally, in the middle, and posteriorly with more or less extensive patches without, or with distinctly sparser punctures; interstices on average distinctly broader than diameter of punctures; lateral margins with few long setae.

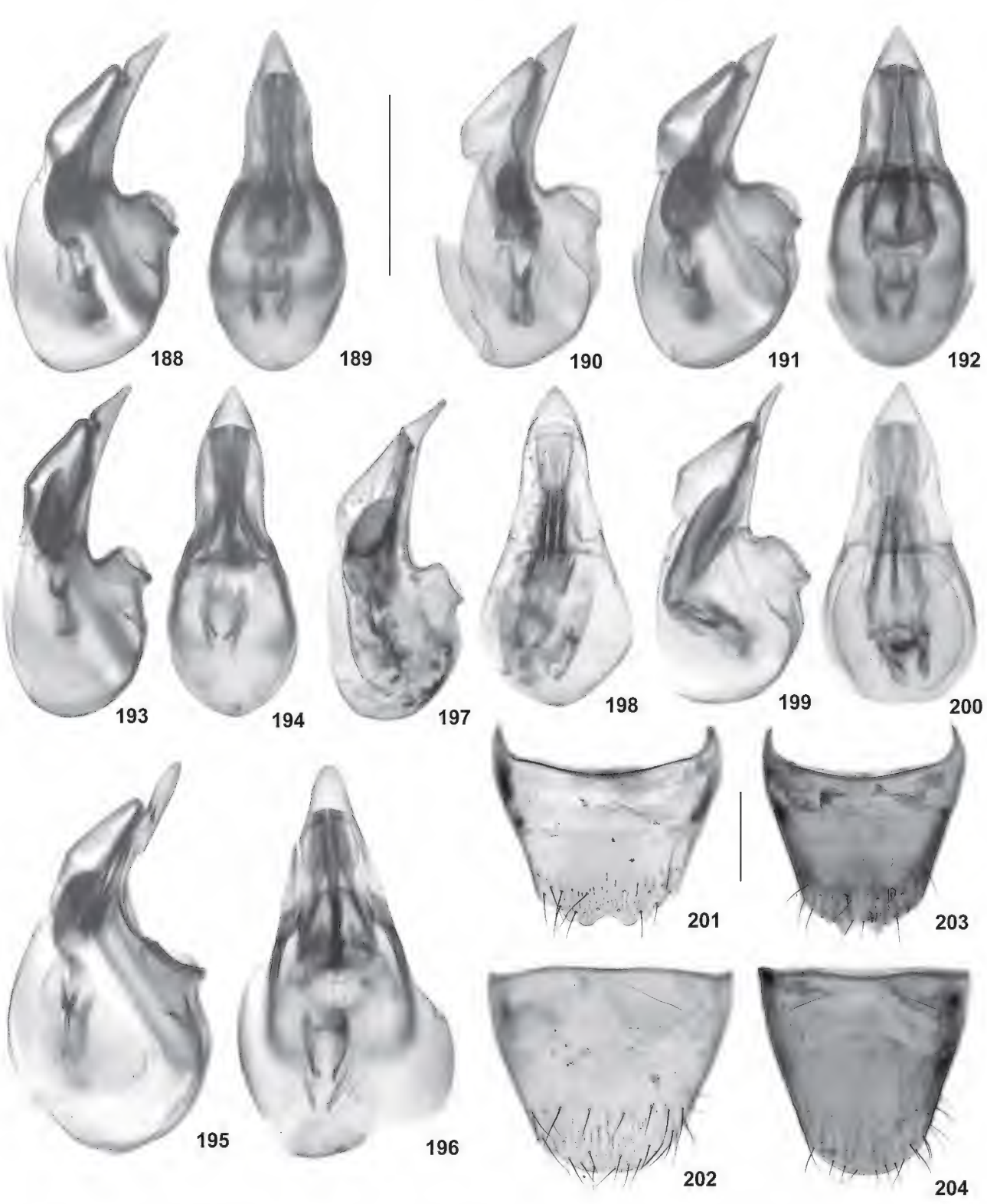
Elytra (Fig. 83) approximately 0.95 times as long as pronotum; punctation denser than that of pronotum, interstices approximately as broad as diameter of punctures. Hind wings fully developed. Metatarsomere I slightly shorter than the combined length of II–IV.

Abdomen (Fig. 141) approximately 0.9 times as broad as elytra, with rather shallow anterior impressions on tergites III–V, and with conspicuously sparse punctation; anterior impressions of tergites III–IV with sparse non-setiferous punctation; anterior impression of tergite V with few fine non-setiferous punctures, discs of tergites III–V practically impunctate aside from few scattered punctures, without median pairs of punctures, laterally and postero-laterally with few setiferous punctures bearing long dark setae; posterior margins of tergites III–V nearly impunctate; tergites VI and VII without non-setiferous punctures anteriorly; tergite VI impunctate, except for a few scattered punctures anteriorly, laterally, and postero-laterally; tergite VII posteriorly with two irregular rows of sparse setiferous punctures, otherwise impunctate; tergite VIII with few sparse setiferous punctures in posterior third; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe.

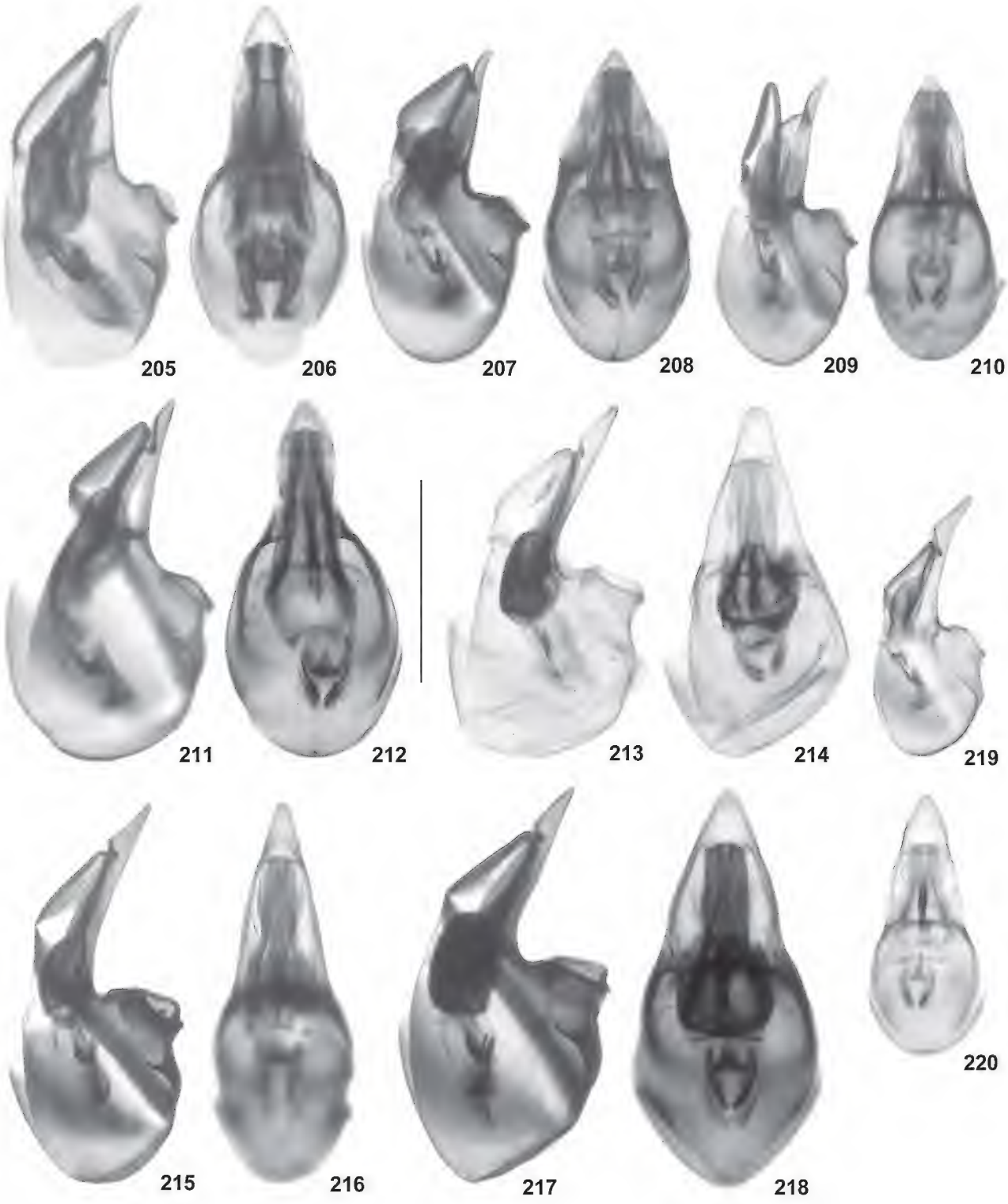
♂: tergite VIII with some granulose punctures posteriorly, posterior margin with distinct concavity in the



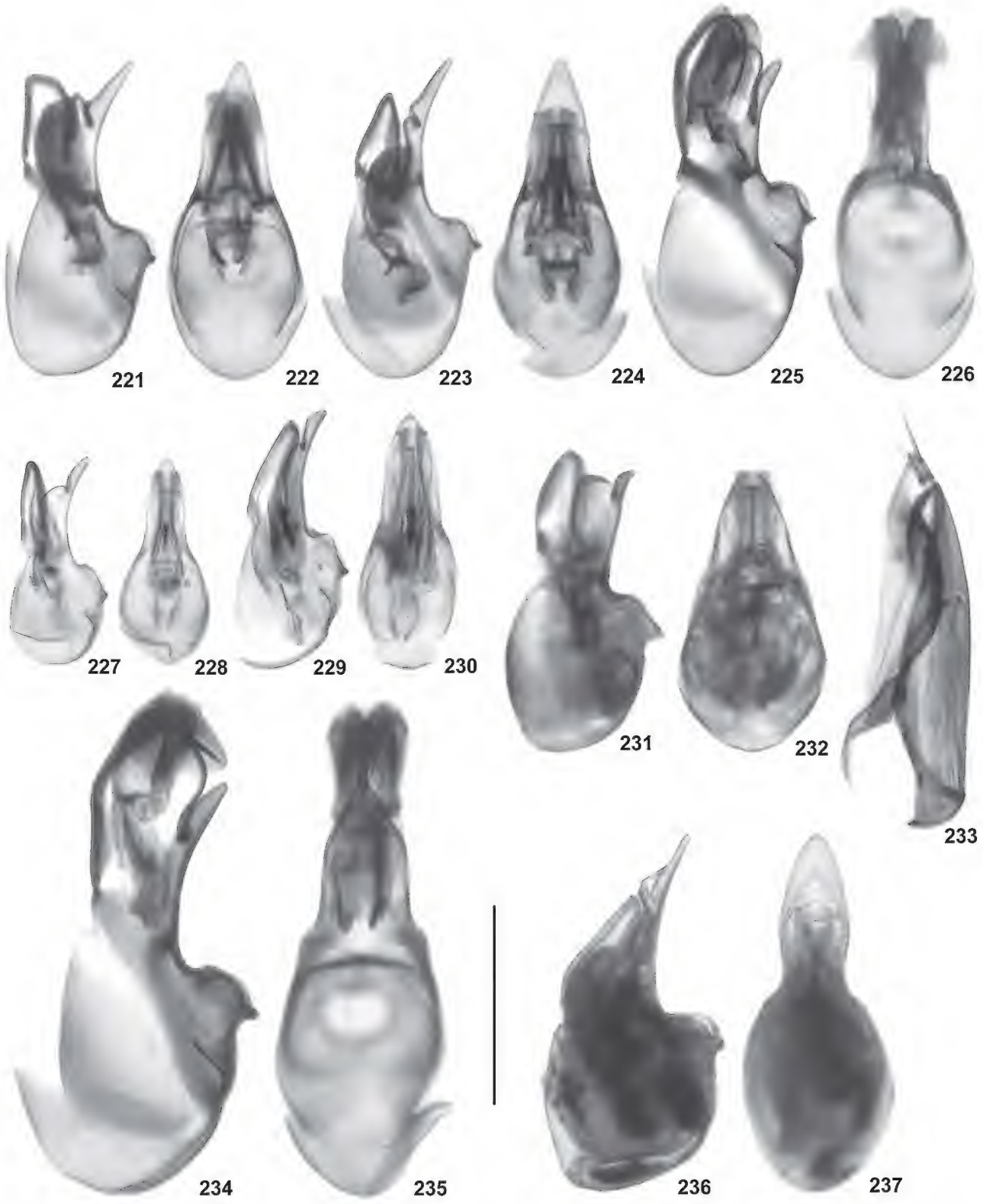
Figs. 176–187. Median lobe of aedeagus in lateral and in ventral view of *Zyras* spp. – **176–177**. *malaisei* (paratype). **178–179**. *chinkiangensis* (lectotype). **180–181**. *alboantennatus*. **182–183**. *kambaitiensis* (Yunnan). **184–185**. *rufapicalis*. **186–187**. *rufoterminalis*. – Scale bar: 0.5 mm.



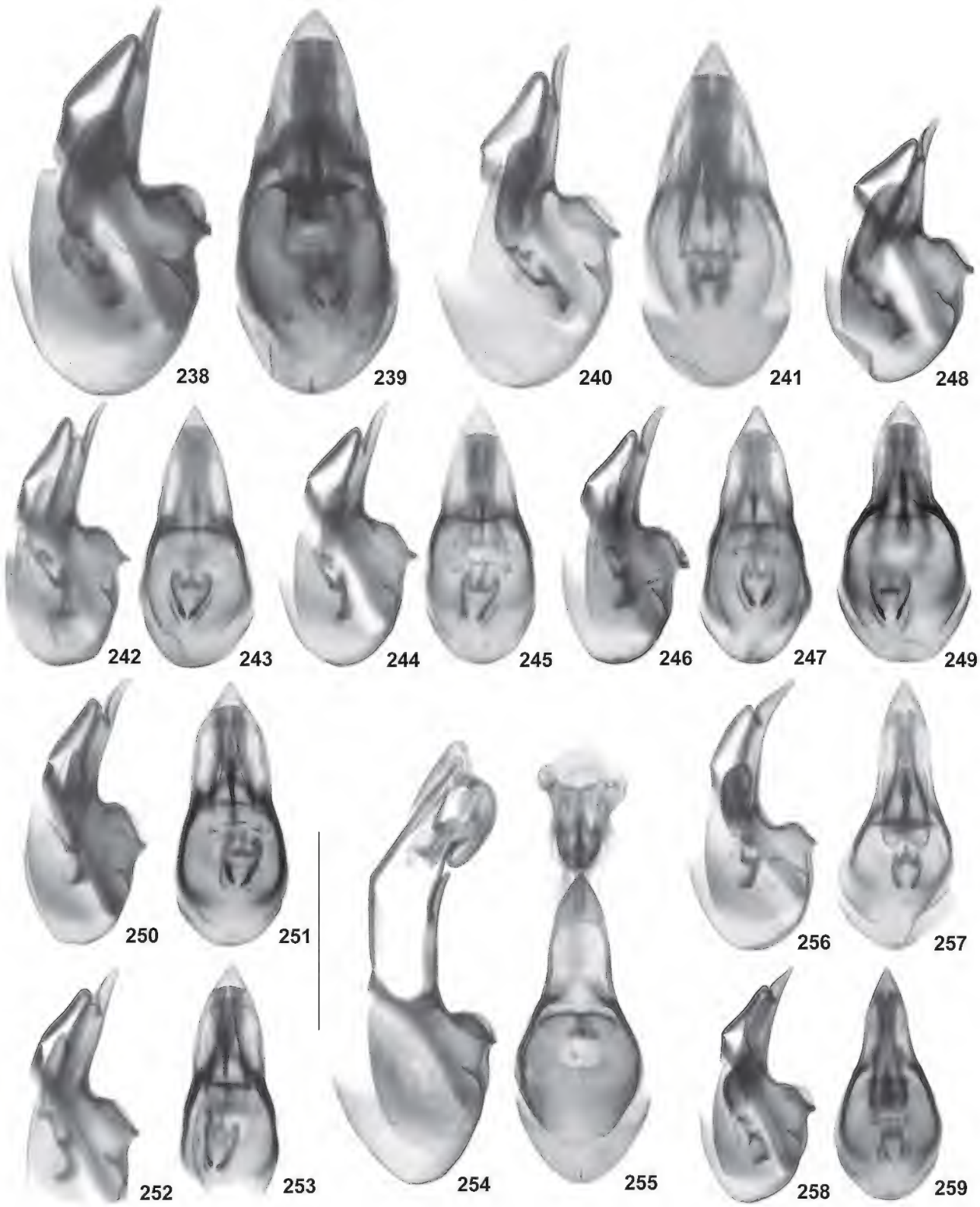
Figs. 188–204. Median lobe of aedeagus in lateral and in ventral view (188–200), male tergite VIII (201, 203), and male sternite VIII (202, 204) of *Zyras* spp. – **188–189**. *birmanus* (Yunnan). **190–192**. *shaanxiensis*. **193–194**. *wei* (Fujian). **195–196**. *firmicornis*. **197–198**. *subobsoletus*. **199–200**. *sibiricus* (Beijing). **201–202**. *malaisei* (paratype). **203–204**. *kambaitiensis* (paratype). – Scale bars: 0.5 mm.



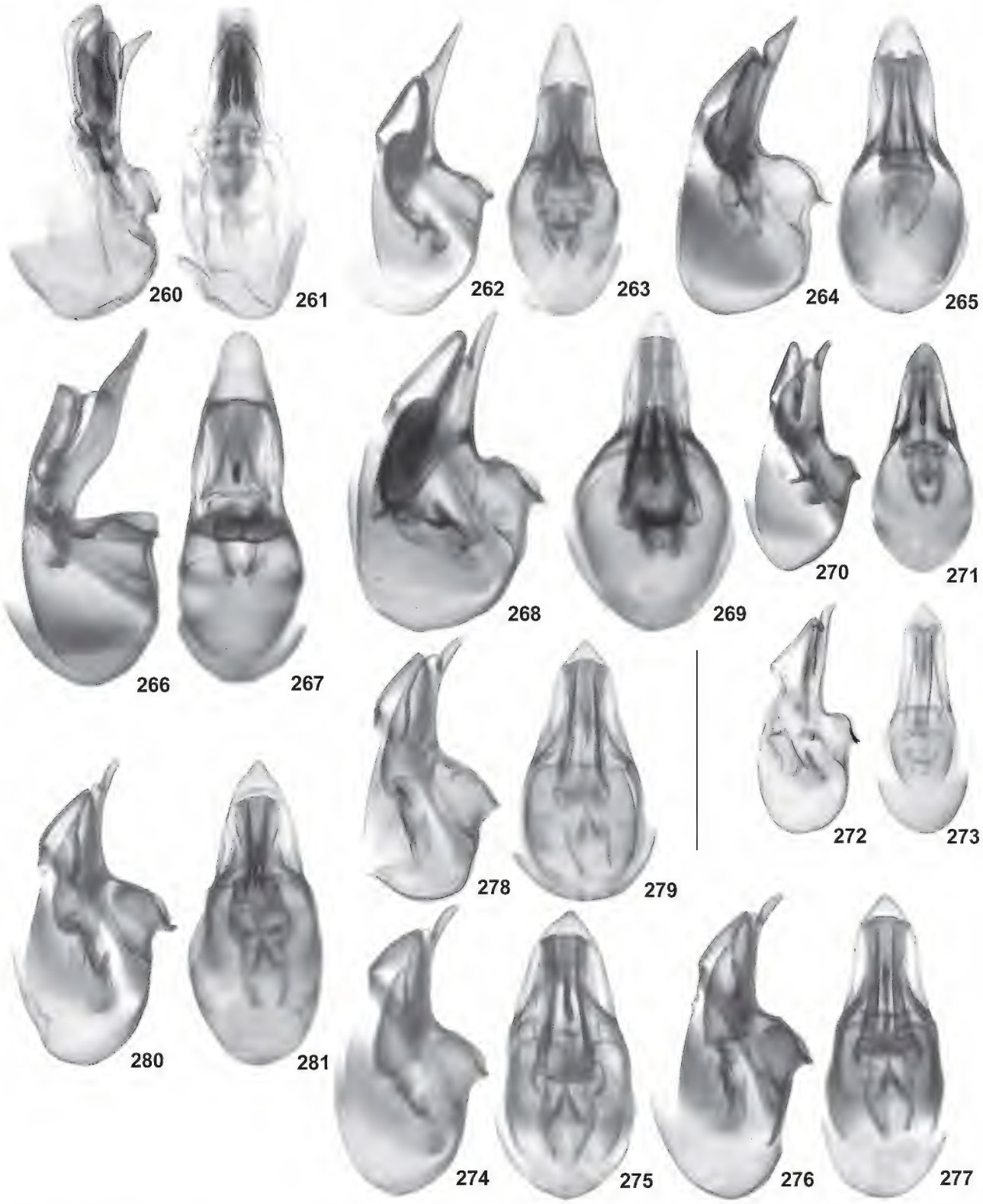
Figs. 205–220. Median lobe of aedeagus in lateral and in ventral view of *Zyras* spp. – **205–206**. *bangmaicus*. **207–208**. *inexcisus*. **209–210**. *sibiricus* (Hokkaido). **211–212**. *granapicalis*. **213–214**. *lativentris*. **215–216**. *caloderoides*. **217–218**. *gilvipalpis*. **219–220**. *dabanicus*. – Scale bar: 0.5 mm.



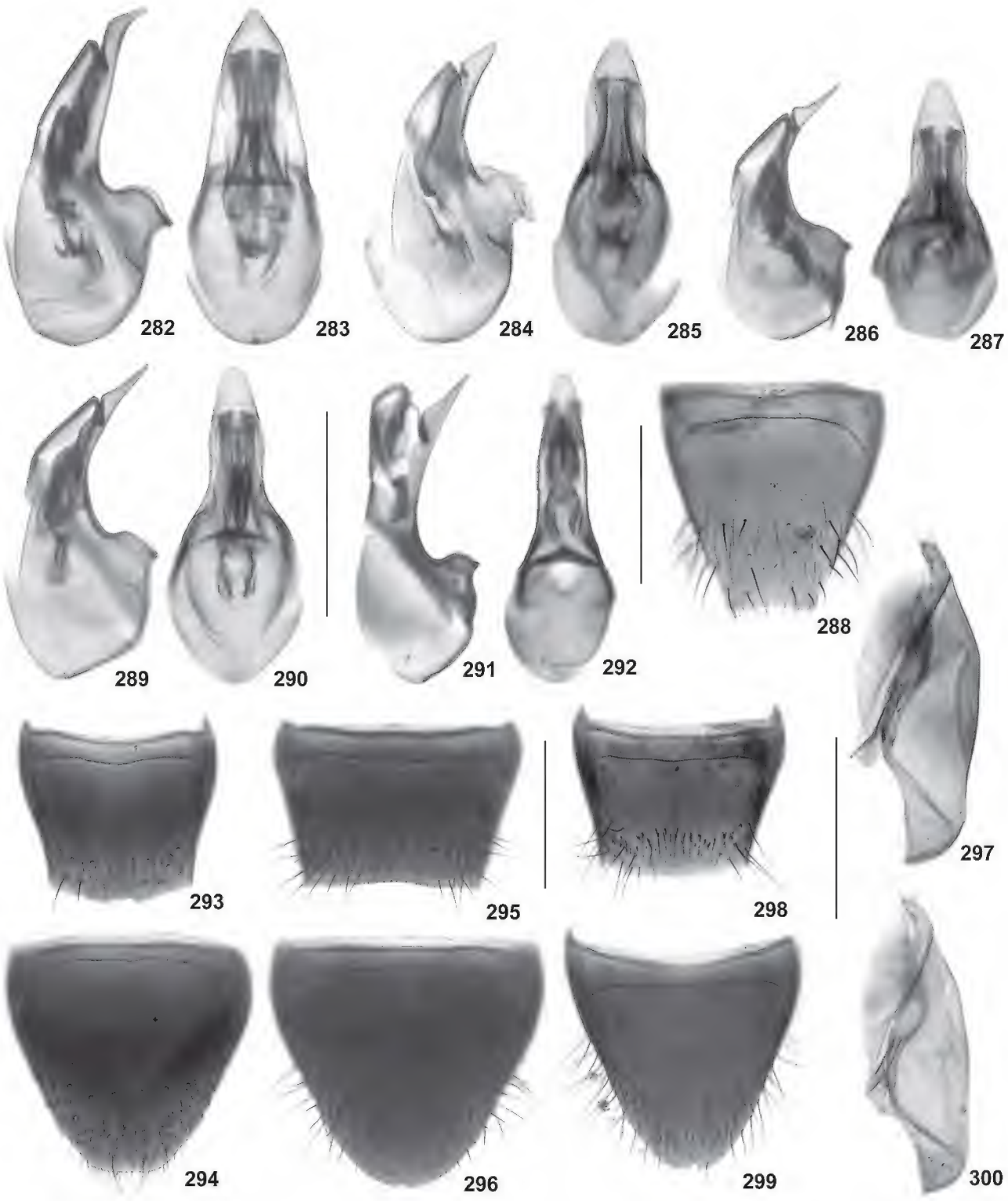
Figs. 221–237. Median lobe of aedeagus in lateral and in ventral view (221–232, 234–237) and paramere (233) of *Zyras* spp. – **221–222**. *maculicollis*. **223–224**. *tenuicornis*. **225–226**. *notaticornis*. **227–228**. *volans*. **229–230**. *hebes*. **231–233**. *atrapicalis*. **234–235**. *nigrapicalis*. **236–237**. *seminigerrimus* (lectotype). – Scale bar: 0.5 mm.



Figs. 238–259. Median lobe of aedeagus in lateral and in ventral view of *Zyras* spp. – **238–241**. *nigricornis* (238–239: Sichuan; 240–241: Hubei). **242–247**. *tenebricosus* (242–243: Songpan env.; 244–245: Pingwu env.; 246–247: Tibet). **248–249**. *atronitens*. **250–251**. *tumidicornis*. **252–253**. *athetoides*. **254–255**. *nigronitens*. **256–257**. *beijingensis*. **258–259**. *pulcher*. – Scale bar: 0.5 mm.



Figs. 260–281. Median lobe of aedeagus in lateral and in ventral view of *Zyras* spp. – **260–261**. *schuelkei*. **262–263**. *discolor*. **264–265**. *exspoliatus*. **266–267**. *bisinuatus*. **268–269**. *iniquus*. **270–271**. *bicoloricollis*. **272–273**. *fratrumkadooriorum* (paratype). **274–277**. *hongkongensis* (274–275: Guangxi; 276–277: Vietnam). **278–279**. *geminus* (paralectotype). **280–281**. *articollis*. – Scale bar: 0.5 mm.



Figs. 282–300. Median lobe of aedeagus in lateral and in ventral view (282–287, 289–292), male sternite VIII (288, 294, 296, 299), male tergite VIII (293, 295, 298), and paramere (296, 298) of *Zyras* spp. – **282–283**. *flexus*. **284–285**. *formosanus*. **286–288**. *glabricollis* (holotype). **289–290**. *extensus*. **291–292**. *rectus*. **293–294**. *exspoliatus*. **295–297**. *hongkongensis* (Guangxi). **298–300**. *geminus* (paralectotype). – Scale bars: 0.5 mm.

middle; sternite VIII somewhat longer than tergite VIII, its posterior margin convex; median lobe of aedeagus 0.83 mm long and shaped as in Figs. 221–222.

♀: tergite VIII with simple punctation, posterior margin convex; posterior margin of sternite VIII weakly concave.

Intraspecific variation

The paratype from Jiangxi differs from the two type specimens from Hubei by larger body size, nearly obsolete reddish spots on the pronotum, somewhat denser and coarser punctation of the pronotum, and more extensively blackish elytra. In other respects, however, it is highly similar, suggesting that the differences should be attributed to intra- rather than interspecific variation.

Comparative notes

Among the species with a similar coloration pattern and of similar size, *Z. maculicollis* is characterized by the relatively small pronotum, the presence of two indistinct reddish spots near the anterior angles of the pronotum, the coloration and punctation pattern of the abdomen, as well as by the morphology of the median lobe of the aedeagus.

Distribution and natural history

The known distribution is confined to two geographically close localities in the Daba Shan, Western Hubei, and one in the Wuyi Shan, Jiangxi (Fig. 305). The specimens from Hubei were sifted from leaf litter and moss in mixed deciduous forests at altitudes between 1550 and 1960 m. The paratype from Jiangxi was collected at an altitude between 1800 and 2050 m.

Zyras (Zyras) tenuicornis **n. sp.**
(Figs. 26, 84, 142, 223–224, 302)

Type material

Holotype ♂: "Taiwan – Kao-Hsiung Co., Yushan N. P., Road 20, km 117, 1800 m, road sides, slopes, litter, 13.IV.2009, leg. Vít [9] / Holotypus ♂ *Zyras tenuicornis* sp. n. det. V. Assing 2014" (cAss).

Paratypes: 1♀ [most of antennae missing]: "Taiwan – Taipeh, Yangmingshan, slopes E Mt. Cising, Lenghuiskeng Visitor Centre, 800 m, 25.X. 2007, leg. Vít" (cAss); 1♂: "Lushan (Wenchuan), Nantou – Hsien, Taiwan (1200 m), July 29th, 1983, Y. Shibata leg." (cMar); 2♂♂, 1♀: "Szuling, c. 1100 m, Taoyuan Taiwan, 19.XI.2000, Hiroshi Sugaya leg. (Under dead leaves)" (cMar, cAss).

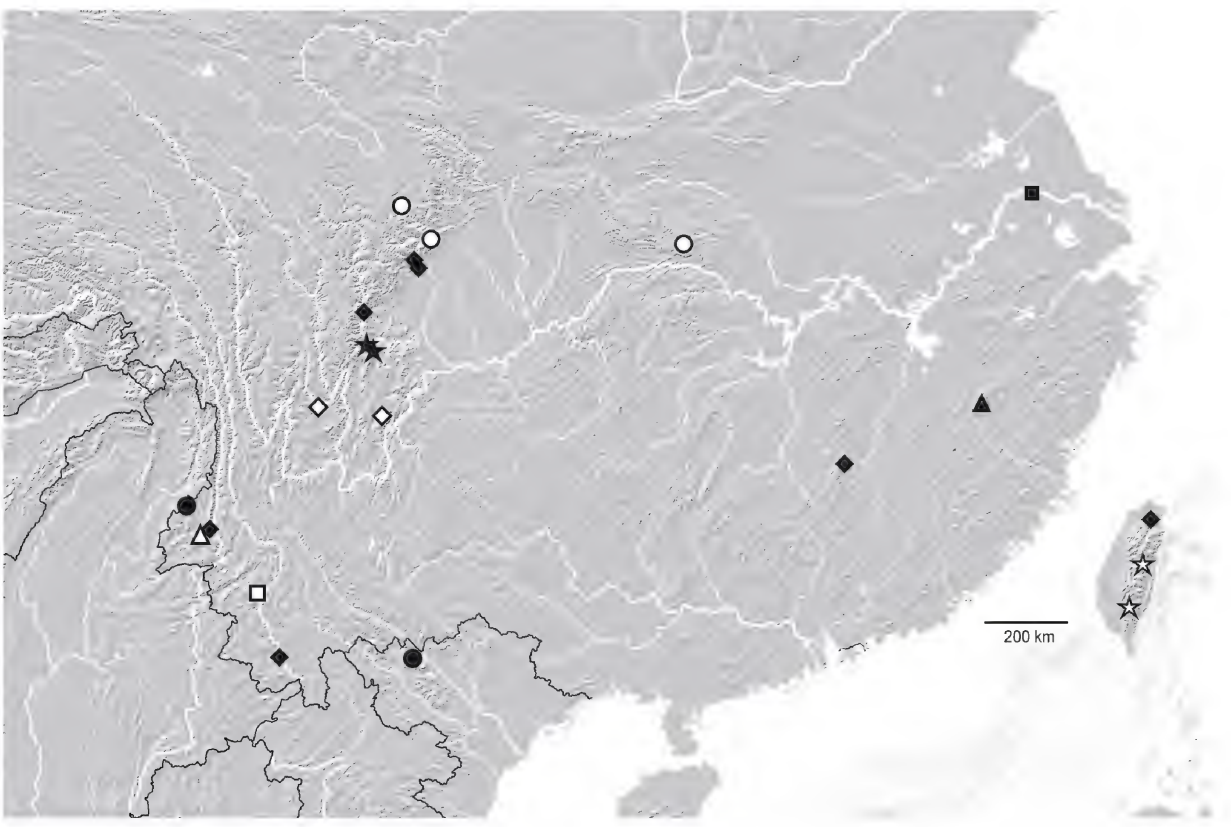


Fig. 301. Distributions of *Zyras* spp. in China and adjacent regions, exclusively based on examined records. – *malaisei* (black circles), *lativentris* (white triangle), *bangmaicus* (white square), *granapicalis* (white diamonds), *nigrapicalis* (black diamonds), *subobsoletus* (black stars), *rufoterminalis* (white circles), *chinkiangensis* (black square), *firmicornis* (black triangle), *rufapicalis* (white stars).

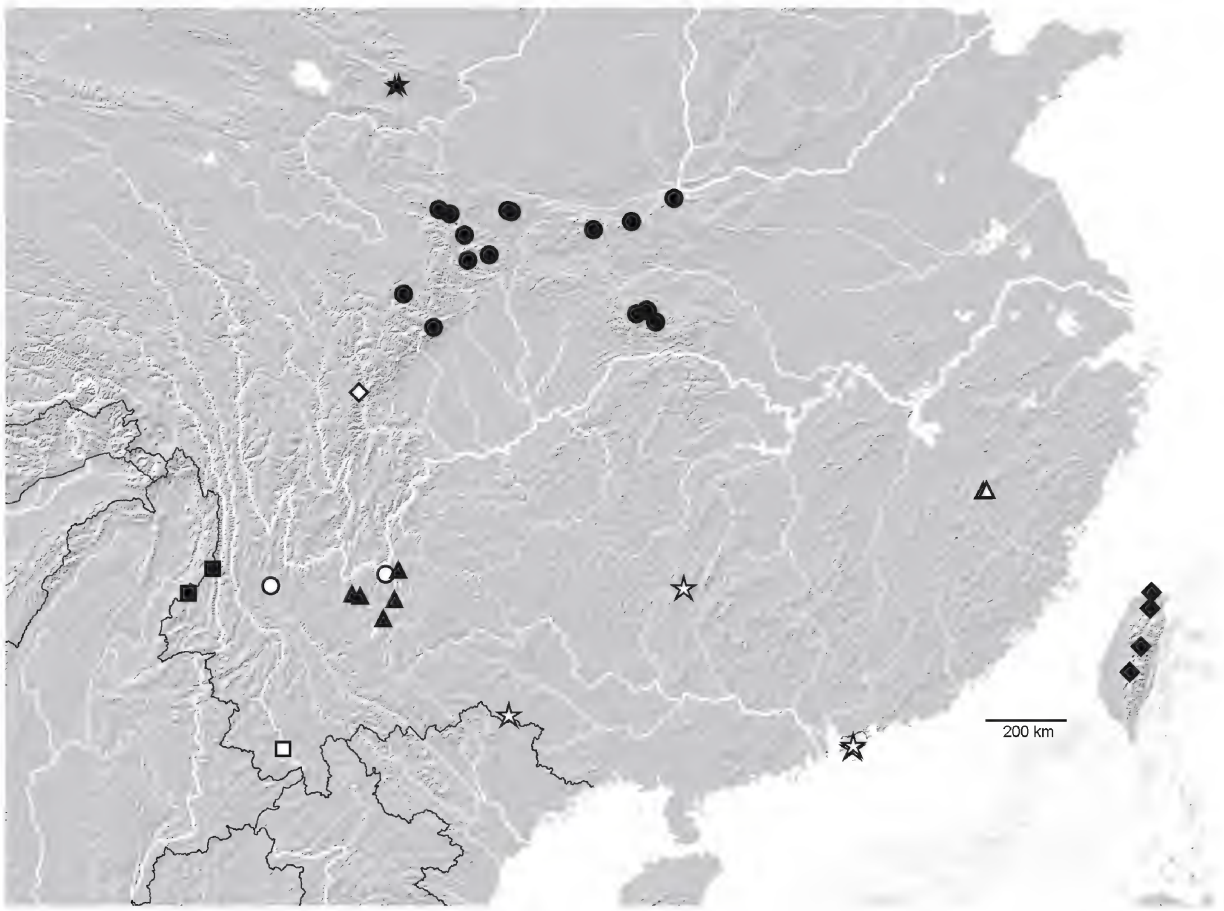


Fig. 302. Distributions of *Zyras* spp. in China and adjacent regions, exclusively based on examined records. – *kambaitiensis* (black squares), *atrapicalis* (white square), *shaanxiensis* (circles; white circles: female-based records), *caloderoides* (black triangles), *seminigerrimus* (white diamond), *dabanicus* (black stars), *notaticornis* (white stars), *flexus* (white triangles), *tenuicornis* (black diamonds).

Etymology

The specific epithet (Latin, adjective) alludes to the slender antennae.

Description

Body length 6.2–7.0 mm; length of forebody 2.7–3.0 mm. Coloration: head and pronotum blackish-brown; elytra yellowish, with the postero-lateral portions extensively blackish-brown (Fig. 84); abdomen (Fig. 142) bicoloured, with segments III–V reddish and VI–VIII blackish-brown, except for the reddish anterior portions of tergites VI–VII and paratergites VI–VII; legs pale-yellowish; maxillary palpi brown, except for the reddish terminal palpomere; antennae (Fig. 26) blackish brown, with antennomeres I–III dark-reddish and apex of XI brown.

Head (Fig. 84) relatively weakly transverse, 1.13 times as broad as long, broadly impunctate along middle; punctation in lateral dorsal portions very sparse; interstices much broader than diameter of punctures. Eyes distinctly longer than postocular region in dorsal view. Antenna (Fig. 26) 2.2–2.3 mm long and very slender; antennomeres IV–VI oblong; VII–VIII approximately as long as broad; IX–X weakly transverse; XI approximately as long as the combined length of IX and X.

Pronotum (Fig. 84) small in relation to head, 1.10–1.15 times as broad as long and approximately 1.25 times as broad as head; punctation sparse; interstices on average much broader than diameter of punctures; midline rather broadly impunctate; lateral margins with few very long setae.

Elytra (Fig. 84) approximately 0.85 times as long as pronotum; punctation coarse, defined, and not very dense, interstices on average broader than diameter of punctures. Hind wings fully developed. Metatarsomere I approximately as long as the combined length of II–IV.

Abdomen (Fig. 142) distinctly narrower than elytra, broadest at segments III–IV, gradually tapering towards apex, and with rather deep and narrow anterior impressions

on tergites III–V; anterior impressions of tergites III–V each with a row of dense coarse non-setiferous punctures; tergite III with a pair of setiferous punctures in the middle and two setiferous punctures near paratergites on either side, without punctures at posterior margin; tergite IV with a pair of setiferous punctures in the middle of the otherwise impunctate posterior margin and with two setiferous punctures near paratergites on either side; tergite V with a median pair of punctures, two lateral punctures on either side, and a row of approximately 10 setiferous punctures at posterior margin; tergite VI with a transverse row of coarse punctures near anterior margin, a somewhat irregular transverse row of approximately 8 setiferous punctures in the middle, and a row of approximately 10 punctures at posterior margin; tergite VII with approximately 15–30 non-setiferous punctures anteriorly, and two transverse rows of setiferous punctures, one behind middle and one near posterior margin; tergite VIII with few scattered punctures near anterior margin and with few setiferous punctures in posterior portion; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe.

♂: posterior margin of tergite VIII weakly concave in the middle; sternite VIII somewhat longer than tergite VIII, its posterior margin weakly convex in the middle; median lobe of aedeagus (Figs. 223–224) 0.83 mm long, with a ventral process of distinctive shape in lateral view.

Comparative notes

Among the species with a similar coloration pattern and of similar size, *Z. tenuicornis* is characterized by the dark coloration of the maxillary palpi (much darker

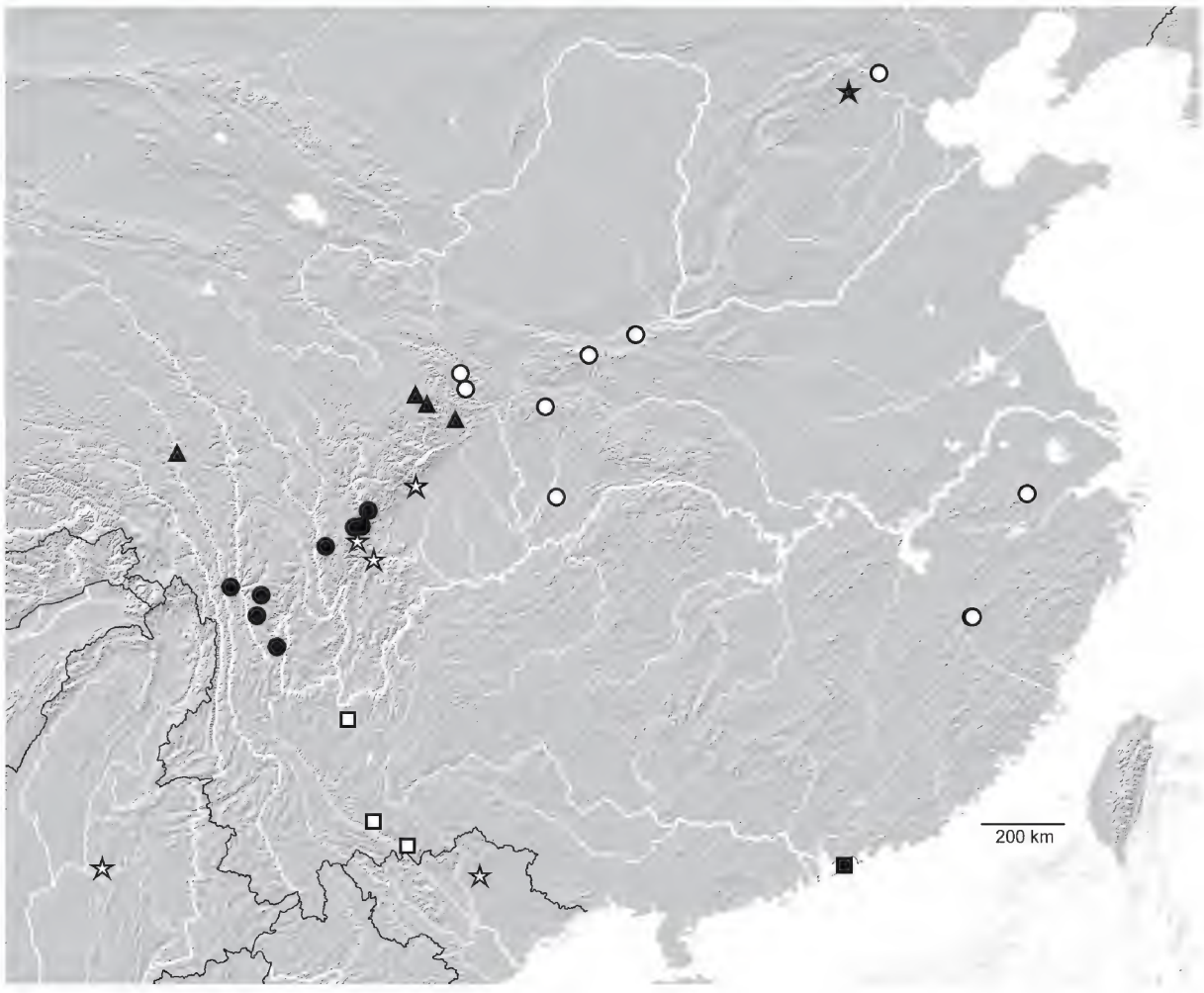


Fig. 303. Distributions of *Zyras* spp. in China and adjacent regions, exclusively based on examined records. – *nigricornis* (black circles), *atronitens* (white square), *birmanus* (black circles), *nigronitens* (black stars), *gilvipalpis* (black triangles), *discolor* (white triangles).

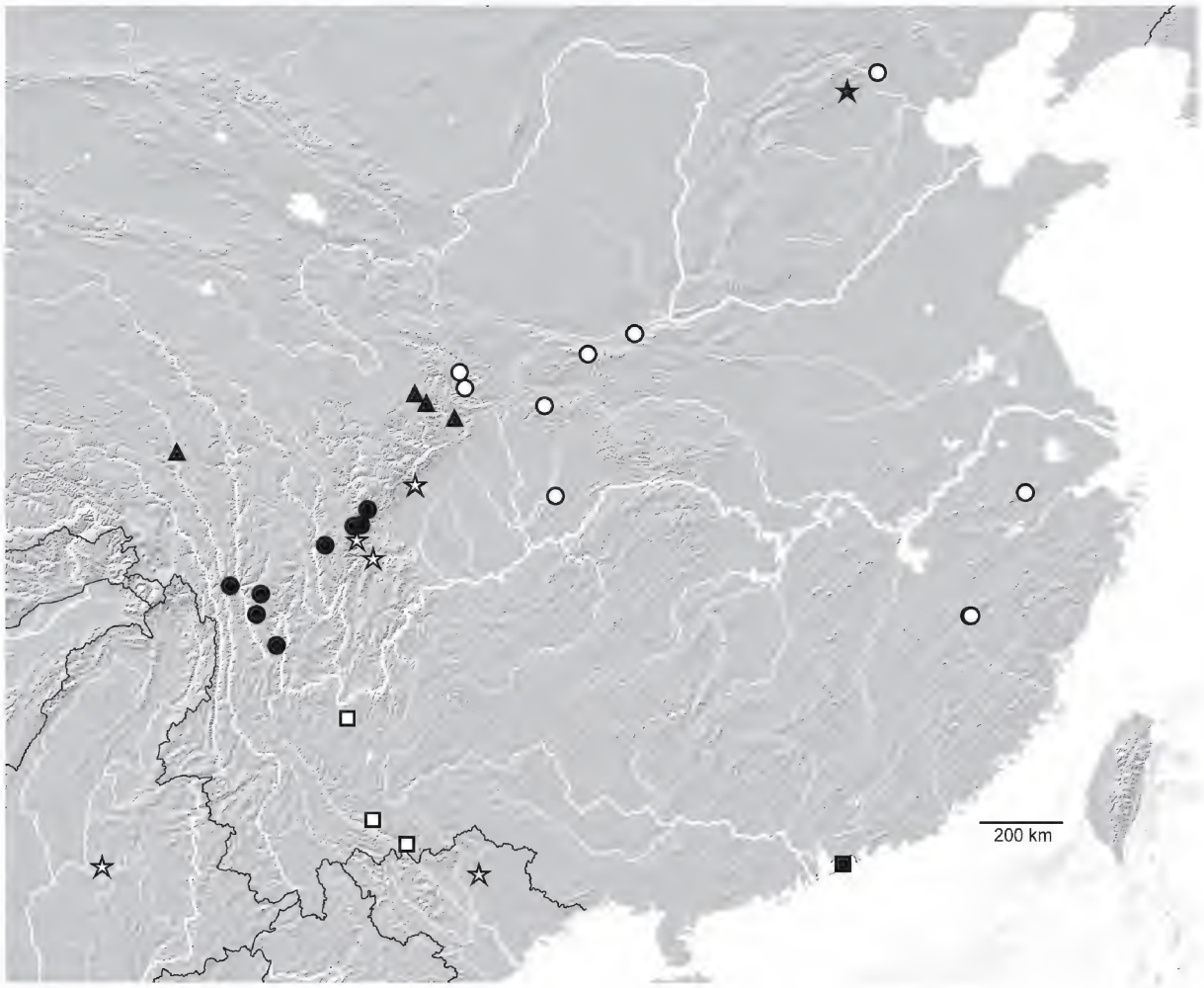


Fig. 304. Distributions of *Zyras* spp. in China and adjacent regions, exclusively based on examined records. – *tumidicornis* (black circles), *tenebricosus* (black triangles), *beijingensis* (white circles), *alboantennatus* (white stars), *bisinuatus* (white square), *sibiricus* (black triangle; records from other countries omitted), *fratrumkadooriorum* (black square).

than the legs), the sparse punctation of the forebody, the presence of very long setae at the lateral margins of the pronotum, the punctation pattern of the abdomen, the rather small and slender pronotum, and particularly by the slender antennae and by the shape of the ventral process of the aedeagus. The median lobe of the aedeagus is very similar to that of *Z. maculicollis*, from which *Z. tenuicornis* differs by the coloration (antennae distinctly darker, abdominal apex much more extensively black), more slender antennae, denser punctation of the elytra, and the punctation pattern of the abdomen.

Distribution and natural history

The type specimens were collected in four localities in Kaohsiung, Taoyuan, Nantou, and Taipeh Hsien, Taiwan (Fig. 302), by sifting leaf litter at altitudes of 800–1800 m.

Zyras (Zyras) volans **n. sp.**

(Figs. 55, 167, 169, 227–228)

Type material

H o l o t y p e ♂: "N. Taiwan: Tai Pai Co, 9 k. Nei Tong Logging Road, 850 m NN, 5–9.X.2002 by FIT, Collr. C. I. Li / Holotypus ♂ *Zyras volans* sp. n. det. V. Assing 2015" (MNHUB).

Etymology

The specific epithet is the present participle of the Latin verb volare (to fly) and alludes to the fact that the holotype was collected on the wing.

Description

Rather small species; body length 5.3 mm; length of forebody 2.1 mm. Coloration: head dark-brown with paler frons; pronotum brown with the antero-lateral portions

extensively diffusely paler yellowish-brown; elytra dark-yellowish with the postero-lateral portions rather weakly infuscate (Fig. 169); abdomen (Fig. 167) with tergites II–IV pale-reddish, tergites V–VI dark-brown with pale-reddish margins, tergite VII brown with the anterior portion reddish, and tergite VIII dark-reddish; legs dark-yellowish; antennae (Fig. 55) blackish-brown; maxillary palpi brown with yellowish palpomere IV.

Head (Fig. 169) moderately transverse, broadly impunctate along middle; punctation in lateral dorsal portions coarse and very sparse; interstices much broader than diameter of punctures. Eyes distinctly longer than postocular region in dorsal view. Antenna (Fig. 55) 1.6 mm long; antennomere IV very weakly transverse; antennomeres V–X of gradually increasing width and increasingly transverse; X more than 1.5 times as broad as long; XI of cylindrical shape and approximately as long as the combined length of VIII–X.

Pronotum (Fig. 169) rather small in relation to head, 1.15 times as broad as long and 1.18 times as broad as head, weakly convex in cross-section, and strongly tapering posteriad; punctation sparse, coarse, and irregularly distributed; antero-lateral portions with extensive impunctate areas; midline rather broadly impunctate; lateral margins each with four long setae.

Elytra (Fig. 169) approximately 0.85 times as long as pronotum; punctation coarse, defined, and not very dense, interstices on average distinctly broader than diameter of punctures. Hind wings fully developed. Metatarsomere I shorter than the combined length of II–IV.

Abdomen (Fig. 167) narrower than elytra and with shallow anterior impressions on tergites III–V; anterior impressions of tergites III–V each with a row of dense non-setiferous punctures; anterior portions of tergites VI and VII without non-setiferous punctures; tergites III–IV with a lateral setiferous puncture on either side and with four setiferous punctures at posterior margin; tergites V–VI with a lateral puncture on either side and with six setiferous punctures at posterior margin; tergite VII with a lateral setiferous puncture on either side and with two partly somewhat irregular transverse rows of setiferous punctures, one of them in posterior portion and one at posterior margin; tergite VIII with sparse punctures bearing long black setae in posterior portion; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe.

♂: posterior margin of tergite VIII distinctly concave in the middle; sternite VIII somewhat longer than tergite VIII, its posterior margin broadly convex; median lobe of

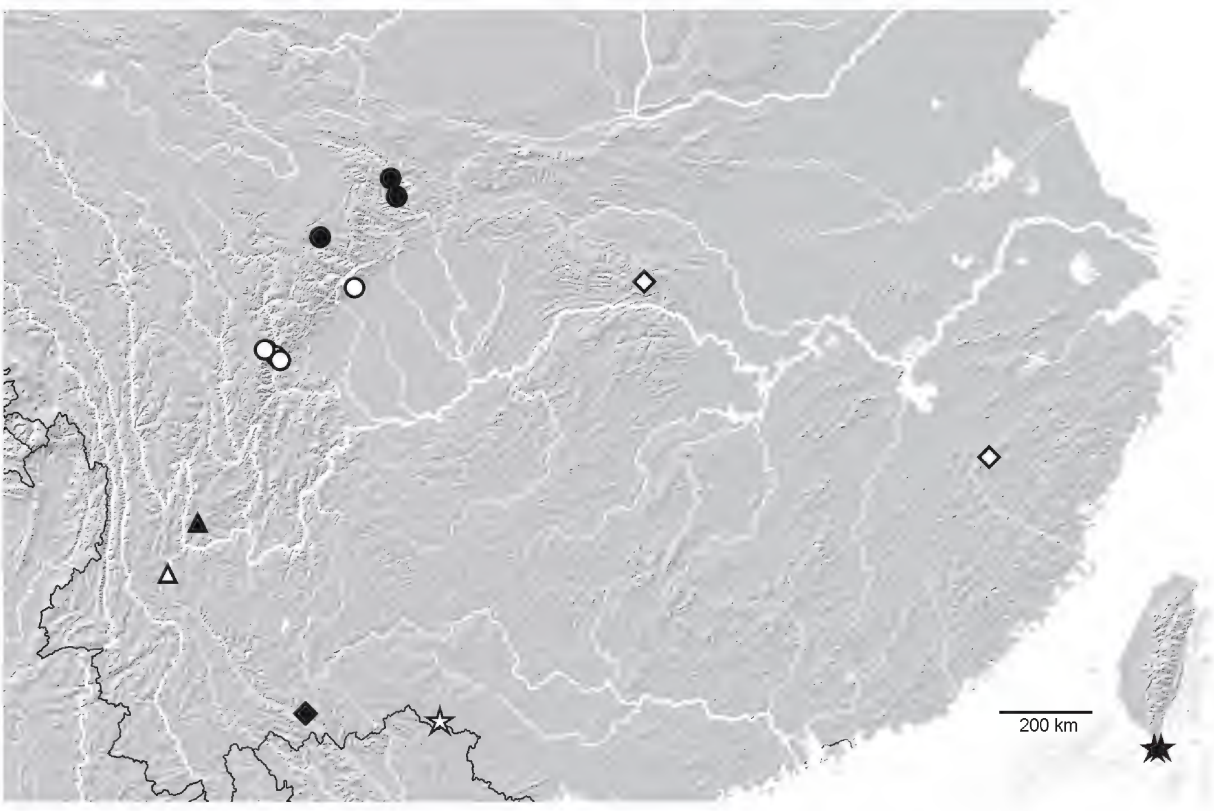


Fig. 305. Distributions of *Zyras* spp. in China and adjacent regions, exclusively based on examined records. – *pulcher* (black circles), *athetoides* (white circles), *yongshengensis* (black triangle), *song* (white triangle), *maculicollis* (white diamonds), *bicoloricollis* (black diamonds), *exspoliatus* (white star), *formosanus* (black stars).

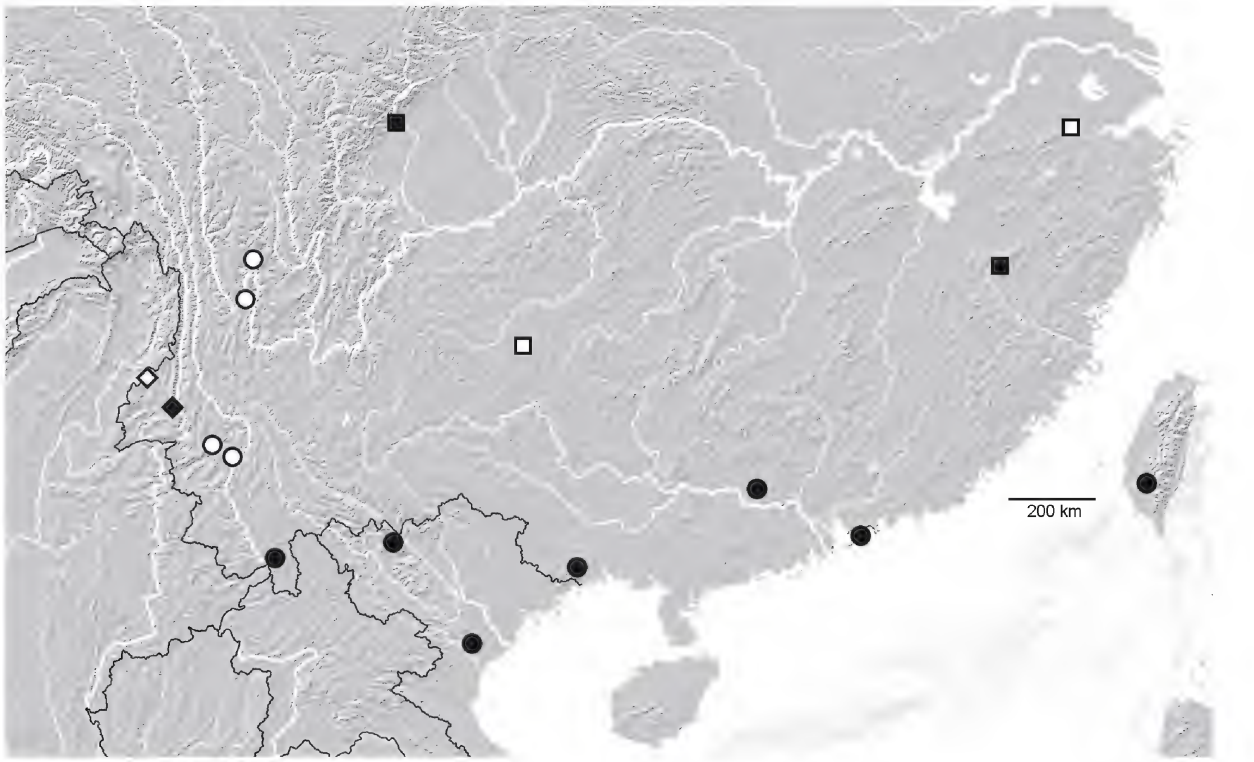


Fig. 306. Distributions of *Zyras* spp. in China and adjacent regions, exclusively based on examined records. – *hongkongensis* (black circles), *extensus* (white circles), *rectus* (black diamond), *glabricollis* (white diamond), *schuelkei* (black squares), *wei* (black and white squares).

aedeagus small, 0.53 mm long, shaped as in Figs. 227–228; apical lobes of parameres moderately long and slender.

Comparative notes

This species is characterized particularly by the small pronotum with irregularly spaced punctation, the diffusely bicoloured pronotum, the punctation pattern of the pronotum (non-setiferous punctures present in the anterior impressions of tergites III–V, but absent in the anterior portions of tergites VI–VII), and by the shape of the median lobe of the aedeagus.

Distribution and natural history

The type locality is situated in Taipeh Hsien, northern Taiwan. The holotype was collected with a flight interception trap at an altitude of 850 m.

Zyras (Zyras) hebes **n. sp.**
(Figs. 36, 168, 170, 229–230)

Type material

Holotype ♂: "C. Taiwan: Tai Chung Co., 40 km., 200 Logging Road, alt. ca. 2000 m, collr. C. L. Li by FIT, 26.–27.VI.2002 / Holotypus ♂ *Zyras hebes* sp. n. det. V. Assing 2015" (MNHUB).

Paratypes: 1 ♀: same data as holotype (cAss); 1 ♂ [damaged, slightly teneral]: "N. E. Taiwan: I Lan [sic] Co., 17 km., 100 Logging Road, alt. ca. 1650 m, 2–4.VII.2003 by FIT, collr. C. L. Li" (cAss); 1 ♀ [teneral]: "N. E. Taiwan: I Lan [sic] Co., 76 km, N. Crossing Highway, 2–4.VII.2003 by FIT, collr. C. L. Li" (MNHUB); 1 ♂ [both elytra missing], 1 ex. [abdominal segments V–X missing]: "Taiwan: Tai, Chung Lo [sic], An Ma Shan, 2 km, 24–26.VI.2003, Flight intercept trap, leg. Chun Li Li" (MNHUB).

Etymology

The specific epithet (Latin, adjective: blunt, obtuse) alludes to the shape of the apex of the ventral process of the aedeagus in lateral view.

Description

Body length 5.5–5.9 mm; length of forebody 2.5 mm. Coloration: head and pronotum brown to dark-brown; elytra dark-yellowish with the postero-lateral portions extensively blackish-brown (Fig. 170); abdomen (Fig. 168) with segments III–V pale-reddish and segments VI–VIII dark-brown with the posterior margin of segment VI reddish; legs yellowish; antennae (Fig. 36) blackish-brown with the basal 2–3 antennomeres reddish to reddish-brown

and antennomeres XI dark-reddish; maxillary palpi yellowish.

Head (Fig. 170) moderately transverse, broadly impunctate along middle; in lateral dorsal portions with few scattered rather coarse punctures; interstices much broader than diameter of punctures. Eyes longer than postocular region in dorsal view. Antenna (Fig. 36) 2.0 mm long and moderately slender; antennomere IV weakly oblong or as long as broad; V approximately as long as broad; antennomeres VI–X of gradually increasing width and increasingly transverse; X approximately 1.5 times as broad as long; XI slightly longer than the combined length of IX and X.

Pronotum (Fig. 170) small in relation to head and weakly transverse, 1.05–1.10 times as broad as long and 1.20–1.24 times as broad as head; punctation moderately sparse to moderately dense in posterior half; antero-lateral portions with impunctate areas; midline rather narrowly impunctate; lateral margins each with four long setae.

Elytra (Fig. 170) 0.80–0.85 times as long as pronotum; punctation coarse, defined, and moderately dense, partly arranged in somewhat irregular transverse series. Hind wings fully developed. Metatarsomere I approximately as long as the combined length of II–IV, or nearly so.

Abdomen (Fig. 168) slightly narrower than elytra and with rather shallow anterior impressions on tergites III–V; anterior impressions of tergites III–V each with few non-setiferous punctures; anterior portions of tergites VI and VII without non-setiferous punctures; tergites III–IV with a median pair of setiferous punctures and two lateral setiferous punctures on either side; tergites V and VI with a lateral setiferous puncture on either side and with four setiferous punctures at posterior margin; tergite VII with a lateral puncture on either side and with two transverse rows of 6–8 setiferous punctures, one of them in posterior portion and one at posterior margin; tergite VIII with numerous punctures bearing long dark setae only in posterior portion; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe.

♂: posterior margin of tergite VIII weakly concave in the middle; sternite VIII somewhat longer than tergite VIII, its posterior margin convex; median lobe of aedeagus 0.68–0.69 mm long; ventral process weakly curved and apically blunt in lateral view (Figs. 229–230).

Comparative notes

Zyras hebes is distinguished from the similar and sympatric *Z. volans*, with which it shares several characters such as a rather small and slender body, similar coloration, and the presence of non-setiferous punctures in the anterior impressions of tergites III–V, but absence of such punctures in the anterior portions of tergites VI–VII, by the distinctly longer, more slender and bicoloured antennae with more transverse antennomeres IV–X, a uniformly coloured pronotum, more distinctly and extensively infuscate postero-lateral portions of the elytra, a less transverse pronotum with less irregularly spaced punctation, the presence of median pairs of punctures on tergites III and IV, and the less strongly curved (lateral view) and apically less slender (ventral view) ventral process of the aedeagus.

Distribution and natural history

The specimens were collected with flight interception traps in several localities in northern and central Taiwan (Taichung and Ilan Hsien) at altitudes of 1650–2000 m. Three paratypes had no altitude indicated on their labels; two specimens collected in July are teneral.

Zyras (Zyras) nigrapicalis **n. sp.**

(Figs. 27, 69, 119, 234–235, 301)

Type material

Holotype ♂: "China (Yunnan) Baoshan Pref., Gaoligong Shan, 29 km ESE Tengchong, 24°55′37″N, 98°45′09″E, 2350 m (devast. decid. forest with clearings and shrubs, litter, wood, sifted), 1.VI.2007 D. W. Wrase [15] / Holotypus ♂ *Zyras nigrapicalis* sp. n. det. V. Assing 2014" (cAss).

Paratypes: 1♂: "China: S-Yunnan (Xishuangbanna), 37 km NW Jinghong, vic. Guo Men Shan / N22°14.43 E100°36.12, 1100 m, 8.VII.2008 MF, leg. L. Meng rice fallow" (NME); 1♀: "China: W-Sichuan 1999, Ganzi Tibet. Aut. Pref., Luding Co., Nebenfluß des Dadu He, 5 km S Luding, 29°53′N, 102°13′E, 1250 m, 23.VI., leg. M. Schülke" (cAss); 1♀: "China: W-Sichuan 1999, Aba Tibet. Aut. Pref., Weizhou Co., Quionglai [sic] Shan, Wolong Tal, 20 km WNW Dujiangyan, 31°05′N, 103°26′E, 1100 m, Schotter, Blüten, 14.VII., leg. M. Schülke" (cSch); 1♀: "China: C-Sichuan, Wenjiang Distr., Dujiangyan Co., Qingcheng Shan, 975 m, 56 km NW Chengdu, 30°54′N, 103°33′E, Feldrand, Strohhaufen, 13.VII., leg. M. Schülke" (cSch); 1♀: "China, Jiangxi prov., 24.IV.2011, Jinggang Shan Mts., Xiping (stream valley; cow dungs [sic]), 26°33.7′N, 114°12.2′E, 915 m, M. Fikáček & J. Hájek leg." (NMP); 1♀: "N.Taiwan: Tai Pai Co, 9 k. Nei Tong Logging Road, 850 m NN, 5–9.X.2002 by FIT, Collr. C.I. Li" (MNHUB).

Etymology

The specific epithet is an adjective composed of the Latin adjectives niger (black) and apicalis (apical). It refers to the black apex of the abdomen, which distinctly contrasts with the reddish anterior portion.

Description

Rather large species; body length 7.0–8.3 mm; length of forebody 2.8–3.6 mm. Coloration: head and pronotum black; elytra pale-reddish, with the postero-lateral portions sharply and triangularly black (Fig. 69); abdomen (Fig. 119) bicoloured, with segments III–VI and anterior portion of VII bright-reddish and the apex black; legs pale-yellowish; maxillary palpi dark-brown; antennae (Fig. 27)

dark-brown to black, with antennomere I reddish-brown to black, II reddish to blackish-brown, XI reddish to blackish with slightly paler apex, and occasionally also antennomeres IX–X somewhat paler.

Head (Fig. 69) distinctly transverse, broadly impunctate along middle; punctation in lateral dorsal portions very sparse; interstices much broader than diameter of punctures. Eyes large and bulging, distinctly longer than postocular region in dorsal view. Antenna (Fig. 27) 2.1–2.4 mm long and slender; antennomeres IV–V weakly oblong; VI approximately as long as broad; VII–IX weakly transverse; X moderately transverse, but less than 1.5 times as broad as long; XI approximately as long as the combined length of IX and X.

Pronotum (Fig. 69) 1.14–1.20 times as broad as long and 1.26–1.33 times as broad as head; punctation rather coarse, of variable density, and irregularly spaced, distinctly sparser in antero-lateral and posterior portions; impunctate midline narrow; lateral margins with some moderately long dark setae.

Elytra (Fig. 69) 0.81–0.90 times as long as pronotum; punctation coarse, defined, and moderately dense, interstices on average slightly broader than diameter of punctures. Hind wings fully developed. Legs long and slender; tarsi thin; metatarsus nearly as long as metatibia; metatarsomere I approximately as long as the combined length of II–IV.

Abdomen (Fig. 119) slightly narrower than elytra and with moderately deep anterior impressions on tergites III–V; anterior impressions of tergites III–V and anterior portions of tergites VI–VII with dense and rather fine non-setiferous punctation; posterior margins of tergites IV–VII each with a row of sparse fine punctures, that of tergite III impunctate; posterior portions of tergites III–VII otherwise nearly impunctate; tergite VIII with few punctures only in posterior portion; posterior margin of tergite VII with palisade fringe.

♂: tergite VII with smooth median elevation posteriorly; posterior margin of tergite VIII sharply concave in the middle, on either side of this concavity with a distinct process, anterior to the concavity with some granulose punctures; sternite VIII somewhat longer than tergite VIII, its posterior margin truncate in the middle; median lobe of aedeagus approximately 1.0 mm long, ventral process rather stout in lateral view (Figs. 234–235).

♀: tergite VII without median elevation; tergite VIII with broadly V-shaped posterior excision, anterior to this excision without granulose punctation.

Intraspecific variation

The three paratypes from Sichuan differ from the holotype by distinctly paler antennae and a denser punctation of the pronotum; the paratype from Taiwan is distinguished from the holotype by somewhat more extensive setiferous punctation of the abdomen. Since no additional significant distinguishing characters were found, the observed differences are attributed to intraspecific variation.

Comparative notes

Zyras nigrapicalis differs from other species recorded from China by its coloration alone. Other species with a similarly coloured abdomen have the pronotum reddish.

Distribution and natural history

The type locality is situated in the Gaoligong Shan, Yunnan (Fig. 301), at an altitude of 2350 m. The holotype was sifted from leaf litter in a degraded deciduous forest. The paratypes were collected in one locality in southern Yunnan with a Malaise trap in a rice fallow at an altitude of 1100 m, in three localities in Sichuan from stream gravel and straw heaps at altitudes of 975–1250 m, in one locality in Jiangxi at an altitude of 915 m, and in one locality in Taiwan with a flight interception trap at an altitude of 850 m.

Zyras (Zyras) atrapicalis **n. sp.**

(Figs. 172–175, 231–233, 302)

Type material

Holotype ♂: "China: S-Yunnan (Xichuangbanna), EKL, 23 km NW Jinghong, vic. Na Ban (NNNR) / N22°09.49, E100°39.92, 28.VI.2008, 730 m, forest, leg. A. Weigel / Holotypus ♂ *Zyras atrapicalis* sp. n. det. V. Assing 2015" (NME).

Paratypes: 1♂, 1♀: "China: S-Yunnan (Xishuangbanna), 23 km NW Jinghong, vic. Na Ban (NNNR) / N22°09.49 E100°39.92, 10.X.2008, leg. L. Meng, 730 m trans. zone MF1" (NME, cAss); 1♀: "China: S-Yunnan (Xishuangbanna), 23 km NW Jinghong, vic. Na Ban (NNNR) / N22°09.49 E100°39.92, 28.VI.2008, leg. A. Weigel, 730 m transition zone MF" (cAss).

Etymology

The specific epithet is an adjective composed of the Latin adjectives ater (black) and apicalis (apical). It refers to the black apex of the abdomen, which distinctly contrasts with the reddish anterior portion.

Description

Body length 6.5–6.8 mm; length of forebody 2.7–3.1 mm. Coloration: head and pronotum blackish; elytra blackish, with the humeral portions yellowish (Fig. 172); abdomen (Fig. 173) bicoloured, with segments II–VI and anterior margin of VII bright-reddish; remainder of segment VII and all of segment VIII blackish-brown; legs pale-yellowish; maxillary palpi dark-brown with yellowish palpomere IV; antennae (Fig. 173) blackish, with antennomeres I dark-brown, II pale-reddish to brown, and XI reddish to dark-reddish.

Head (Fig. 172) strongly transverse, broadly impunctate along middle; punctation in lateral and posterior dorsal portions sparse and coarse; interstices broader than diameter of punctures. Eyes large and strongly bulging, more than twice as long as postocular region in dorsal view. Antenna (Fig. 173) fine and short in relation to body, 1.8–2.1 mm long; antennomeres IV–V approximately as long as broad or very weakly transverse; VI–X weakly and gradually increasing in width and increasingly transverse, X approximately 1.5 times as broad as long, and XI shorter than the combined length of IX and X.

Pronotum (Fig. 172) approximately 1.15 times as broad as long and 1.14–1.21 times as broad as head, broadest near anterior angles; posteriorly with a pronounced median impression; punctures coarse, of different sizes, sparse, and very irregularly spaced, antero-lateral portions extensively, postero-lateral portions less extensively, and midline broadly impunctate; lateral margins with 4–5, anterior margins with 3 long dark setae on either side.

Elytra (Fig. 172) 0.82 times as long as pronotum; punctation coarse, defined, and dense, slightly less dense in posterior than in anterior portions. Hind wings fully developed. Metatarsomere I slightly shorter than the combined length of II–IV.

Abdomen (Fig. 173) narrower than elytra and with moderately deep anterior impressions on tergites III–V; anterior impressions of tergites III–V each with a (partly somewhat irregular) row of rather coarse non-setiferous punctures; anterior portions of tergites VI–VII each with a rather narrow transverse band of scattered non-setiferous punctures; tergite III with a lateral puncture on either side and with six punctures at or near posterior margin, all of them bearing long black setae; tergite IV with a lateral setiferous puncture on either side, with six setiferous punctures at posterior margin, with additional non-setiferous punctures laterally, and with scattered non-setiferous micropunctation on disc; punctation of tergites V and VI similar to that of tergite IV, but posterior margin with 8 setiferous punctures; tergite VII (Fig. 175) with a pair of coarse median punctures, a short transverse row of setiferous punctures near posterior margin, and numerous small setiferous punctures at posterior margin; tergite VIII (Fig. 175) with punctures bearing long black setae in posterior portion; posterior margin of tergite VII with pronounced palisade fringe.

♂: tergite VIII in the middle of posterior portion with a smooth elevation, on either side of this elevation with an impression, posterior margin weakly concave in the middle; sternite VIII somewhat longer than tergite VIII, its posterior margin convex; median lobe of aedeagus (Figs. 231–232) 0.75 mm long and of compact shape; paramere (Fig. 233) 0.95 mm long, slender, and with very short apical lobe.

♀: tergite VIII posteriorly without elevation, posterior margin truncate to indistinctly concave in the middle.

Comparative notes

Zyras atrapicalis differs from the similarly coloured *Z. nigrapicalis* by differently coloured and shorter antennae, more extensively blackish elytra, a more transverse head with larger and more bulging eyes, the shape and sparser punctation of the pronotum, the punctation pattern of the abdomen, a smaller aedeagus, and the shape of the ventral process of the aedeagus. In habitus, coloration, and punctation of the forebody, the new species much resembles *Z. inversus* Pace, 2012 from Thailand (male unknown; holotype examined), from which it is distinguished by the much shorter and paler antennomere XI (*Z. inversus*: antennomere XI black and approximately as long as the combined length of antennomeres VIII–X), the shape of the head (*Z. inversus*: head of transversely oval shape), larger eyes, and by the punctation pattern of the abdomen (*Z. inversus*: non-setiferous punctation of anterior portions of tergites III–VI much denser, coarser, and more extensive).

Distribution and natural history

The type locality is situated in southern Yunnan (Fig. 302). The specimens were collected on the wing in a forest and in transitional habitats at an altitude of 730 m.

Zyras (Zyras) nigricornis **n. sp.**

(Figs. 8, 63, 120, 238–241, 303)

Zyras shaanxiensis: Pace (2012a); misidentification.
Zyras wei: Pace (2012a); misidentification.

Type material

Holotype ♂: "China – Sechuan, Jitiang [recte: Jintang], 3.7.–14.7.2001, lgt. E. Kučera / coll. Feldmann, Münster / Holotypus ♂ *Zyras nigricornis* sp. n. det. V. Assing 2014" (cAss).

Paratypes: 2♂♂, 1♀ [1 teneral]: "China, W Hubei, 21.–24.VI., Da Shennongjia mts., 31.5N 110.3E, 2500–3000 m, Jaroslav Turna leg. 2001" (cMar, cAss); 1♀: "China (N.Sichuan) 70 km N Songpan, road S 301, above Gan lake, 2700 m, 33°15′26″N, 103°46′03″E, spruce forest with birch, litter, moss, soil sifted), 12.VIII.2012 D. W. Wrase [26]" (cSch); 1♀: "China Sichuan, Emei Shan, Leidongping, 2500 m, 18.VII.1996, 29°32N 103°21E C65 / collected by A. Smetana, J. Farkač and P. Kabátek / *Zyras saanxiensis* [sic] Pace, det. R. Pace 1999" (cAss); 1♂, 1♀: "China Sichuan, Emei Shan, 3000 m, 29°32N 103°21E, 17.VII.1996 C64 / collected by A. Smetana, J. Farkač and P. Kabátek / *Zyras saanxiensis* [sic] Pace, det. R. Pace 1999" (cSme); 2♂♂: "China: W-Hubei daba [sic] Shan E of Mt. Da Shennongjia, 12 km / NW Muyuping 31°30′N, 110°21′E 1950 m, A Smetana (C117) / *Zyras wei* Pace, det. R. Pace 2005" (cSme, cAss); 11 exs.: "China: Sichuan, Daxue Shan, 25 km SE Kangding, 3200–3500 m, 13.VI.–4.VII.2009, leg. A. Plutenko" (cSch, cAss); 2♂♂: "China – NW Sichuan, 20 km NW Maowen, 2150 m, Jiuding Shan, coniferous wood, 7–28.VI.2004, leg. R. Fabbri" (cSch, cAss); 1♀: "China (W Sichuan), Daxue Shan, Mu Ge Cuo, NW Kanding 3200–3400 m, 30.11 N, 101.52 E, 21.V.1997 Wrase" (cSch); 1♂, 1♀: "China – W Sichuan, S Barkam, between Lianghekou–Fubian, 3450–3650 m, *Quercus*

shrubs and mixed wood, 10–30.VI.2004, leg. R. Fabbri" (cSch, cAss); 1 ♂: "China – W Sichuan, 3550–3650 m, Jiajin Shan, Jintang, 18 km E, primary coniferous forest, 1–24.VI.2004, leg. R. Fabbri" (cSch); 1 ♂, 2 ♀♀: "China – NW Sichuan, 25 km E of Barkam, Suo Mo Xian, 2850 m, mixed forest, 9–29.VI.2004, leg. R. Fabbri" (cSch); 1 ♀: "China – W Sichuan, 5.6.2006, West of Zhier, est. 4241 M, N 28°20.886′ E 101°28.381′ lat. R. Sehnal & M. Tryzna" (cSch); 2 ♀♀: "China: S-Gansu, Minshan Mts., 60 km NW Wudu, 2000 m, 10.–20.VI.2005, V. Patrikeev" (cSch); 6 exs.: "China (S-Shaanxi) Daba Shan, mount. range N pass 22 km NW Zhenping, N-slope, 2850 m, 32°01′N, 109°21′E (nr. mount. top, *Abies*, bushes-sifted), 13.VII.2001 Wrase [12]" (cSch, cAss); 1 ex.: same data, but leg. Schülke (cSch); 4 exs.: "China: S-Shaanxi (Qinling Shan), mountain range W pass on rd. Xi'an–Shagoujie, 45 km SSW Xi'an, 33°52′N, 108°46′E, 2675 m, leg. M. Schülke [C01-20B] / 25.–26.VII.2001, N-slope, *Abies*, *Betula*, *Larix*, *Rhododendron*, subalpine meadows, pitfall traps (vinegar) [C01-20B]" (cSch, cAss); 3 exs.: "China (W-Hubei) Daba Shan, mountain range NE Muyuping, pass 12 km N Muyuping, 31°32′N, 110°26′E, 2380 m, N pass (N-slope, young decid. for., shrubs, moss) 17.–21.VII.2001 Wrase [15]" (cSch, cAss); 1 ♀: "China (Qinghai Prov.), road 301 km 180, 43 km ESE Men Yuan, 2704 m, 37°09′32.06″N, 102°02′06.0″E (creek valley with *Picea*, *Salix*, *Populus*, *Betula*, litter/moss sifted) 5.VII.2011 D. W. Wrase [19]" (cAss).

Etymology

The specific epithet (Latin, adjective) alludes to the uniformly blackish-brown antennae.

Description

Relatively large species, but size very variable; body length 5.7–8.2 mm; length of forebody 2.8–3.9 mm. Usual coloration: forebody blackish-brown to black, sometimes with the suture of the elytra slightly paler (Fig. 63); abdomen (Fig. 120) blackish-brown, often with the posterior margins of the segments yellowish-red to red; legs pale-yellowish, rarely darker; maxillary palpi yellowish to yellowish-brown; antennae (Fig. 8) uniformly blackish-brown, basal and apical antennomeres rarely paler.

Head (Fig. 63) distinctly transverse, broadly impunctate along middle; punctation in lateral dorsal portions somewhat variable, moderately dense; interstices broader than, as broad as, or narrower than diameter of punctures. Eyes slightly longer than postocular region in dorsal view. Antenna (Fig. 8) 2.2–3.0 mm long and moderately massive; antennomere IV weakly transverse; V–VIII as long as broad or weakly transverse; IX–X weakly to moderately transverse, less than 1.5 times as broad as long; XI distinctly shorter than the combined length of IX and X.

Pronotum (Fig. 63) approximately 1.13–1.20 times as broad as long and 1.32–1.37 times as broad as head; punctation moderately dense to rather dense; interstices on average slightly broader than, as broad as, or slightly narrower than diameter of punctures; midline narrowly impunctate; lateral margins without long setae.

Elytra (Fig. 63) 0.83–0.88 times as long as pronotum; punctation defined and dense, interstices on average approximately as broad as, slightly broader, or slightly narrower than diameter of punctures. Hind wings fully developed. Metatarsomere I approximately as long as, or slightly shorter than the combined length of II–IV.

Abdomen (Fig. 120) relatively large, as broad as, or slightly narrower than elytra, with moderately deep anterior impressions on tergites III–V, and with somewhat variable, but always very fine punctation; anterior impressions of tergites III–V impunctate, or nearly so (exceptionally with few non-setiferous micropunctures); posterior margins of tergites III–VII each with row of numerous setiferous punctures; disc of tergite III with irregular transverse row of rather sparse punctures, with scattered punctures, or impunctate, except for a lateral puncture near paratergites on either side; discs of tergites IV–V with two irregular transverse rows of punctures, or with scattered irregular punctures, or impunctate, except for one or two lateral punctures on either side; tergite VI anteriorly with a transverse series with very sparse punctures, disc with three irregular transverse rows of punctures, or with few irregular punctures, or practically impunctate (except for two lateral setiferous punctures near paratergites on either side); posterior half of tergite VII with irregular sparse and fine punctation not arranged in rows; tergite VIII in posterior fourth with rather dense and distinct setiferous punctures, in anterior three-fourths impunctate, or nearly so; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe.

♂: posterior margin of tergite VIII truncate in the middle, this truncate portion delimited by more or less pronounced tooth-like projection on either side; sternite VIII somewhat longer than tergite VIII, its posterior margin weakly convex or weakly concave in the middle; median lobe of aedeagus of remarkably variable size, 0.82–0.98 mm long and shaped as in Figs. 238–241.

♀: posterior margin of tergite VIII smoothly convex; posterior margin of sternite VIII weakly concave in the middle.

Intraspecific variation

This species is subject to enormous intraspecific variation of size, coloration, punctation of the abdomen, and even the size of the aedeagus. Specimens from Sichuan tend to be larger and darker, to have a much more sparsely punctate abdomen (surfaces of anterior tergites often impunctate, or nearly so, except for the row of marginal setiferous punctures) and a larger aedeagus than material from the Daba Shan. These differences, however, are linked by intermediate conditions, so that they are attributed to intra- rather than interspecific variation.

Comparative notes

Zyras nigricornis is characterized by the usually almost uniformly dark coloration of the body, the usually uni-

formly blackish-brown antennae, the rather broad abdomen, the sparse punctation of the abdomen, the shapes of the male and female tergite VIII, and by the morphology of the aedeagus.

Distribution and natural history

This species was found in several mountain ranges in North and West Sichuan, in the Qinling Shan, the Daba Shan eastwards to the Da Shennonjia range, and one locality in Qinghai (Fig. 303). According to HIEKE (2005), Jitiang (type locality) is a misspelling and refers to Jintang (30°18′N, 102°12′E) to the northeast of Kangding, West Sichuan. The altitudes range from 1950 to 4240 m. Most of the specimens were sifted from litter and moss in mixed, coniferous, and deciduous forest or in shrub habitats. One paratype collected in June is teneral.

Zyras (Zyras) tenebricosus **n. sp.**
(Figs. 45, 85, 143, 242–247, 304)

Type material

Holotype ♂: "China [24] – N-Sichuan, pass NW Songpan, 3600 m, 32°55′32″N, 103°25′56″E, sifted, 11.VIII.2012, V. ASSING / Holotypus ♂ *Zyras tenebricosus* sp. n. det. V. ASSING 2014" (cAss).

Paratypes: 1 ♀: same data as holotype (cAss); 1 ♀: "China [23] – N-Sichuan, pass ENE Songpan, 3920 m, 32°44′23″N, 103°44′31″E, sifted, 10.VIII.2012, V. ASSING" (cAss); 1 ♂: "China: N-Sichuan, Pass betw. Pingwu and Juijaigow, 3000 m, 10.–15.VII.2005, V. PATRIKEEV" (cAss); 1 ex.: "China – W Sichuan, 3550–3650 m, Jiajin Shan, Jintang, 18 km E, primary coniferous forest, 11–24.VI.2004, leg. R. FABBRI" (cSch); 1 ♂: "E Tibet, 'Tamala Shan' pass, road Qamdo–Toba, 20 km NE Qamdo, 31°16′N, 97°18′E, 4800 m, alpine meadow, 16.VII.1997, JAROSLAV TURNA leg." (cSch).

Etymology

The specific epithet (Latin, adjective: dark) alludes to the black coloration of the whole body.

Description

Body length 5.5–6.5 mm; length of forebody 2.7–3.1 mm. Coloration: whole body black (Figs. 85–143); legs blackish, with the tarsi reddish and with the tibial bases and apices narrowly reddish to brown; maxillary palpi greyish-red, with the apical palpomere pale-reddish; antennae (Fig. 45) uniformly black.

Head (Fig. 85) distinctly transverse, broadly impunctate along middle in posterior half; punctation in lateral and anterior dorsal portions moderately dense; interstices on average approximately as broad as diameter of punctures. Eyes slightly longer than postocular region in dorsal view. Antenna (Fig. 45) 1.9–2.0 mm long, not massive; antennomere III nearly twice as long as broad; IV–IX distinctly transverse, gradually and weakly increasing in width; X weakly transverse and longer than IX; XI approximately as long as the combined length of IX and X.

Pronotum (Fig. 85) 1.10–1.15 times as broad as long and 1.25–1.32 times as broad as head; punctation moderately dense; interstices on average as broad as, or slightly broader than diameter of punctures; midline narrowly impunctate; lateral margins without long setae.

Elytra (Fig. 85) 0.83–0.86 times as long as pronotum; punctation defined and rather dense, interstices on average slightly narrower than diameter of punctures. Hind wings fully developed. Metatarsomere I approximately as long as, or slightly shorter than the combined length of II–IV.

Abdomen (Fig. 143) approximately 0.9 times as broad as elytra and with moderately deep anterior impressions on tergites III–V; anterior impressions of tergites III–V and anterior portion of tergite VI with sparse and fine non-setiferous punctation; posterior margins of tergites III–VII each with row of numerous setiferous punctures; posterior portions/halves of tergites III–VII with irregular punctation not arranged in distinct transverse series; posterior portion of tergite VIII with denser punctation; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe.

♂: posterior margin of tergite VIII barely noticeably concave in the middle; sternite VIII somewhat longer than tergite VIII, its posterior margin weakly convex; median lobe of aedeagus 0.65 mm long and shaped as in Figs. 242–247; ventral process very flat (lateral view).

♀: posterior margin of tergite VIII convex; posterior margin of sternite VIII very weakly concave in the middle.

Comparative notes

Zyras tenebricosus is characterized by the dark coloration of the body, the legs, and the antennae, by the morphology of the antennae, the punctation pattern of the abdomen, and by the morphology of the aedeagus. For characters distinguishing it from the similar *Z. tumidicornis* see the comparative notes in the following section.

Distribution and natural history

The currently known distribution is confined to five localities in northern and western Sichuan, and in eastern Tibet (Fig. 304). The specimens from the environs of Songpan were sifted from litter and moss on moist north slopes with willow, other shrubs, and rhododendron; the paratype from Tibet was collected in an alpine meadow. The altitudes range from 3000 to 4800 m.

Zyras (Zyras) tumidicornis **n. sp.**
(Figs. 46, 86, 144, 250–251, 304)

Type material

Holotype ♂: "China – Sechuan, Sabde [29°27′N, 101°19′E], 24.6.–28.6.2001, lgt. E. KUČERA / coll. FELDMANN

Münster / Holotypus ♂ *Zyras tumidicornis* sp. n. det. V. Assing 2014" (cAss).

Paratypes: 1 ♀: "China – W Sichuan, 3550–3650 m, Jiajin Shan, Jintang, 18 km E, primary coniferous forest, 1–24.VI.2004, leg. R. Fabbri" (cAss); 1 ♀: "China – W Sichuan, 2950–3200 m, Kangding pref., mixed forest, between Cuilai–Wuouna, 13–21.VI.2004, leg. R. Fabbri" (cSch); 1 ♀: "China: Sichuan, Daxue Shan mts., 25 km SE Kangding, 3200–3500 m, 13.VI.–4.VII.2009, leg. A. Plutenko" (cSch); 1 ♀: "China: Sichuan, Daxue Shan, Gongga Shan Mt., 15 km S Kangding, 3200–3500 m, 5.–10.VII.2004, Plutenko" (cSch); 1 ♀: "China-Yunnan, Zhongdian, 27.6.–30.6.2005, lgt. E. Kučera" (cSch); 1 ♂: "China (N-Yunnan) Zhongdian Co., 48 km N Zhongdian, 28°16.6′N, 99°45.7′E, 3220 m (creek valley with devastated primary forest, field edge), 21.VIII.2003 Wrase [11A]" (cSch); 1 ♀: "China: Yunnan province, 32 km N Lijiang, 21.VI.2007, Maoniuping [Yak meadows], 27°09.9′N, 100°14.5′E, 3540 m, J. Hájek & J. Růžička leg. [CH41] / sifted detritus, leaves and moss: steep slope, wet mixed forest (with *Pinus*, *Abies*, *Rhododendron*)" (cSch); 1 ♂: "China (N-Yunnan) Diqing Tibet. Aut. Pref., Deqin Co., Baima Shan, E-side pass 12 km SE Deqin / 28°23.86′N, 98°59.04′E, 4085–4200 m, small creek valley (dry slope with shrubs), 10.VI.2005 D. W. Wrase [08]" (cAss).

Etymology

The specific epithet (Latin, adjective) alludes to the massive antennae, particularly the conspicuously large antennomeres I and III.

Description

Body length 6.4–8.1 mm; length of forebody 3.1–4.0 mm. Coloration: whole body black (Figs. 86, 144); legs blackish-brown, with dark-brown tibiae and reddish tarsi; maxillary palpi reddish; antennae (Fig. 46) uniformly black.

Head (Fig. 86) distinctly transverse, narrowly to broadly impunctate along middle or only in posterior half; punctation in lateral and anterior dorsal portions moderately dense to dense; interstices on average mostly somewhat broader than diameter of punctures. Eyes approximately as long as postocular region in dorsal view, or somewhat longer. Antenna (Fig. 46) 2.2–2.9 mm long, rather massive; antennomere I conspicuously large; III large, distinctly coniform, and barely 1.5 times as long as broad; IV–IX distinctly transverse, gradually increasing in width; X weakly transverse and longer than IX; XI distinctly shorter than the combined length of IX and X.

Pronotum (Fig. 86) approximately 1.15 times as broad as long and 1.30–1.35 times as broad as head; punctation moderately dense; interstices on average as broad as diameter of punctures, or broader; midline narrowly impunctate; lateral margins without long setae.

Elytra (Fig. 86) 0.82–0.90 times as long as pronotum; punctation defined and moderately dense, interstices on average slightly broader than diameter of punctures. Hind wings fully developed. Metatarsomere I approximately as long as the combined length of II–IV.

Abdomen (Fig. 144) approximately 0.95 times as broad as elytra and with moderately deep anterior impressions on tergites III–V; anterior impressions of tergites III–V impunctate or nearly so, only with few scattered fine non-setiferous punctures at most; tergite VI anteriorly with few scattered non-setiferous punctures; posterior margins of tergites III–VII each with row of numerous setiferous punctures; discs of tergites III–IV each with two transverse rows of setiferous punctures (anterior row sometimes reduced to few punctures); tergites V–VII in posterior halves with irregular sparse micropunctation not arranged in distinct series; tergite VIII with sparse punctation in posterior portion and practically impunctate in anterior half; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe.

♂: posterior margin of tergite VIII barely noticeably concave in the middle, nearly truncate; sternite VIII somewhat longer than tergite VIII, its posterior margin weakly convex or nearly truncate in the middle; median lobe of aedeagus approximately 0.7 mm long and shaped as in Figs. 250–251; ventral process not conspicuously flat (lateral view).

♀: posterior margin of tergite VIII weakly convex in the middle; posterior margin of sternite VIII weakly concave in the middle.

Comparative notes

In many respects, *Z. tumidicornis* resembles *Z. tenebricosus*, from which it differs by the more robust body, the longer and more massive antennae with a distinctly larger antennomere I and a distinctly larger, more coniform, and less oblong antennomere III, by the practically impunctate anterior impressions of tergites III–V, the presence of transverse series of punctures on tergites III and IV, the generally sparser punctation of the abdomen, and by the differently shaped aedeagus (ventral process less flat).

Distribution and natural history

The species was found in several localities in western Sichuan and northern Yunnan (Fig. 304) at altitudes between approximately 3000 and approximately 4100 m. The specimens were sifted from leaf litter in mixed and coniferous forests, and in a subalpine shrub habitat.

Zyras (Zyras) athetoides **n. sp.**

(Figs. 47, 88, 146, 252–253, 305)

Type material

Holotype ♂: "China: N-Sichuan, Minshan Mts., Baima pass, 3000 m, 5.–20.VII.2005 / Holotypus ♂ *Zyras athetoides* sp. n. det. V. Assing 2014" (cAss).

Paratypes: 1 ♀: "China: W-Sichuan (6), Daxue Shan, Paoma-Shan b. Kangding, 30.02.56N, 101.58.05E, 2700–2900 m, 22.05.1997, M. Schülke" (cSch); 1 ♀: "China: W-Sichuan (7), Daxue Shan, W Kangding, 30.03.13N, 101.57.11E,

2700–2800 m, 24.05.1997, M. SCHÜLKE" (cSch); 1 ♀: "China: Sichuan, Daxue Shan, 25 km SE Kangding, 3200–3500 m, 13.VI.–4.VII.2009, leg. A. PLUTENKO" (cSch); 1 ♀: "China: W-Sichuan 1999, Ya'an Prefecture, Tianquan Co., E Erlang Shan Pass, 2900 m, 9 km SE Luding, 29°52N, 102°18E, Gesiebe, 20.VI., leg. M. SCHÜLKE" (cAss).

Etymology

The specific epithet (adjective) alludes to faint external resemblance (habitus, coloration) of this species with species of the genus *Atheta* Thomson, 1858.

Description

Small species; body length 4.5–5.7 mm; length of forebody 2.2–2.6 mm. Coloration: body blackish-brown with the humeral portion of the elytra indistinctly and diffusely paler and with the posterior margins of the abdominal segments reddish (Figs. 88, 146); legs dark-yellowish to yellowish brown, with the femora somewhat darker; antennae (Fig. 47) blackish-brown to blackish, with antennomeres I–III only indistinctly paler at most.

Head (Fig. 88) moderately transverse, impunctate along middle; punctation in lateral and anterior dorsal portions moderately dense to dense; interstices on average narrower than diameter of punctures. Eyes longer than postocular region in dorsal view. Antenna (Fig. 47) 1.8–1.9 mm long, distinctly incrassate apically; antennomeres IV–X distinctly transverse, gradually and distinctly increasing in width; X approximately 1.5 times as broad as long; XI shorter than the combined length of IX and X.

Pronotum (Fig. 88) relatively weakly transverse, approximately 1.1 times as broad as long and 1.25–1.30 times as broad as head; punctation moderately dense; interstices on average narrower than diameter of punctures; midline narrowly impunctate; lateral margins without conspicuous long setae.

Elytra (Fig. 88) 0.80–0.85 times as long as pronotum; punctation defined and rather dense, interstices on average narrower than diameter of punctures. Hind wings fully developed. Metatarsomere I distinctly shorter than the combined length of II–IV, barely longer than the combined length II and III.

Abdomen (Fig. 146) relatively broad, nearly as broad as, or slightly narrower than elytra and with moderately deep anterior impressions on tergites III–V; anterior impressions of tergites III–V impunctate or nearly so, only with few scattered fine non-setiferous punctures at most; tergite VI anteriorly with few scattered punctures; tergites III–VII each with row of numerous setiferous punctures at posterior margin and with a more or less distinct transverse row of punctures in posterior portion of disc; tergite VIII with sparse punctation in posterior portion and practically impunctate in anterior half; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe; posterior margin of tergite VIII convex to weakly concave in the middle, without evident sexual dimorphism.

♂: sternite VIII slightly longer than tergite VIII, its posterior margin convex; median lobe of aedeagus approximately 0.65 mm long and shaped as in Figs. 252–253.

♀: posterior margin of sternite VIII truncate in the middle.

Comparative notes

Among the more or less uniformly dark-coloured congeners known from China, *Z. athetoides* is characterized by relatively small size, the relatively short and distinctly incrassate antennae with transverse antennomeres IV–X, the indistinctly paler humeral angles of the elytra, the conspicuously short metatarsomere I, and by the shape of the median lobe of the aedeagus.

Distribution and natural history

The type specimens were collected in several localities in Sichuan (Fig. 305) at altitudes between 2700 and approximately 3500 m.

Zyras (Zyras) atronitens **n. sp.**

(Figs. 48, 89, 147, 248–249, 303)

Type material

Holotype ♂: "E Tibet, road Toba – Jomda, pass 50 km E Toba, 31°19′N, 98°05′E, 4200 m, alpine meadow, 17.VII.1997, JAROSLAV TURNA leg. / Holotypus ♂ *Zyras atronitens* sp. n. det. V. ASSING 2014" (cAss).

Etymology

The specific epithet is composed of the Latin adjectives ater (black) and nitens (shiny) and alludes to the glossy and nearly uniformly black body.

Description

Rather small species; body length 5.8 mm; length of forebody 2.4 mm. Coloration: body blackish, except for the diffusely reddish humeral angles of the elytra, the narrowly reddish elytral suture, and the narrowly reddish posterior margins of the abdominal segments (Figs. 89, 147); legs with dark-brown femora and metatibiae, pale-brown pro- and mesotibiae, and dark-yellowish tarsi; antennae (Fig. 48) blackish, with antennomere XI reddish.

Head (Fig. 89) distinctly transverse, impunctate in median dorsal portion; punctation in lateral and anterior dorsal portions sparse; interstices broader than diameter of punctures. Eyes longer than postocular region in dorsal view. Antenna (Fig. 48) 1.8 mm long, distinctly incrassate apically; antennomere III conical, strongly dilated apically; IV–X distinctly transverse, gradually and distinctly increasing in width; X slightly less than 1.5 times as broad

as long; XI approximately as long as the combined length of IX and X.

Pronotum (Fig. 89) 1.13 times as broad as long and 1.27 times as broad as head; punctation sparse and irregularly spaced; interstices distinctly broader than diameter of punctures; midline broadly impunctate; lateral margins without conspicuous long setae.

Elytra (Fig. 89) 0.87 times as long as pronotum; punctation defined, conspicuously fine and sparse; interstices much broader than diameter of punctures. Hind wings fully developed. Metatarsomere I approximately as long as the combined length of II–IV.

Abdomen (Fig. 147) slightly narrower than elytra, subparallel anteriorly, segments III–VI of subequal width; anterior impressions of tergites III–V shallow and with sparse, very fine non-setiferous punctation; posterior margins of tergites III–VII each with a row of fine punctures; anterior portion of tergite VI with very fine and sparse non-setiferous punctation; remainder of discs of tergites III–VI nearly impunctate, only with very fine scattered punctures; tergite VII with fine non-setiferous punctation in anterior third and with sparse punctures in posterior third, impunctate in median third; tergite VIII with few punctures posteriorly, otherwise impunctate; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe.

♂: posterior margin of tergite VIII very weakly concave in the middle, on either side of this concavity dentate; sternite VIII slightly longer than tergite VIII, its posterior margin convex; median lobe of aedeagus 0.68 mm long and shaped as in Figs. 248–249.

♀: unknown.

Comparative notes

Among the species of similar size and coloration, *Z. atronitens* is characterized particularly by the conspicuously sparse punctation of the forebody, especially of the elytra, and the abdomen, the dark legs, the distinctly incrassate antennae with black antennomeres I–II and with a strongly conical antennomere III, as well as by the morphology of the median lobe of the aedeagus.

Distribution and natural history

The type locality is situated to the east of Toba in eastern Tibet (Fig. 303). The holotype was collected in an alpine meadow at an altitude of 4200 m.

Zyras (Zyras) nigronitens **n. sp.**
(Figs. 49, 87, 145, 254–255, 303)

Type material

Holotype ♂: "China: N-Yunnan [C2005-09], Diqing Tibet. Aut. Pref., Deqin Co., Meili Xue Shan, E-side, 14 km W Deqin, 2850 m, / 28°27.47′N, 98°46.35′E, creek valley below glacier, mixed forest, leaf litter, moss, dead wood, sifted, 11.VI.2005, M. Schülke [C2005-09] / Holotypus ♂ *Zyras nigronitens* sp. n. det. V. Assing 2014" (cAss).

Paratypes: 1 ♀: same data as holotype (cSch); 1 ♂, 1 ex.: "China: N-Yunnan [C2005-07], Diqing Tibet. Aut. Pref., Deqin Co., Meili Xue Shan, E-side, 12 km SW Deqin, 2890 m, 28°25.30′N, 98°48.47′E / small creek valley, mixed forest with bamboo, leaf litter, moss, dead wood, sifted, 9.VI.2005, M. Schülke [C2005-07]" (cSch, cAss); 1 ♂: "China (N-Yunnan) Diqing Tibet. Aut. Pref., Deqin Co., Baima Shan, pass 15 km SE Deqin, 28°22.68′N, 99°00.57′E, 4400–4500 m (alpine meadow, under gravel & stones along creek), 12.VI.2005 D. W. Wrase [10A]" (cSch); 1 ♂, 1 ♀: "China-Yunnan Diqing Tibet. Aut. Pr. Deqin Co. Meili Xue Shan E-side 12 km SW Deqin, 28°25.30′N 98°48.47′E 2890 m, 9.VI.2005 A. Smetana [C156]" (cSme, cAss); 1 ♂: "China-Yunnan Diqing Tibet. Aut. Pr. Deqin Co. Meili Xue Shan E-side 14 km W Deqin, 28°27.47′N 98°46.35′E 2580 m, 11.VI.2005 A. Smetana [C158]" (cSme).

Etymology

The specific epithet is composed of the Latin adjectives niger (black) and nitens (shiny). It refers to the conspicuously black and glossy body.

Description

Body length 6.5–7.5 mm; length of forebody 3.5 mm. Coloration: whole body black and shiny (Figs. 87, 145); legs pale-yellow; maxillary palpi yellow with palpomere III more or less distinctly infuscate; antennae (Fig. 49) black, with antennomeres I–II and base of III reddish to dark-brown and XI pale-reddish, sharply contrasting with antennomere X.

Head (Fig. 87) distinctly transverse, broadly impunctate along middle; punctation in lateral dorsal portions sparse; interstices distinctly broader than diameter of punctures. Eyes much longer than postocular region in dorsal view. Antenna (Fig. 49) 2.0–2.1 mm long, not particularly massive; antennomere IV weakly transverse; V–X distinctly transverse, gradually and weakly increasing in width; X distinctly transverse, approximately 1.5 times as broad as long; XI approximately as long as the combined length of IX and X, or nearly so.

Pronotum (Fig. 87) strongly convex in cross-section, 1.08–1.12 times as broad as long and 1.31–1.38 times as broad as head; punctation very sparse; interstices on average much broader than diameter of punctures; midline moderately narrowly impunctate; lateral margins and antero-lateral portion with some very long black setae.

Elytra (Fig. 87) 0.78–0.80 times as long as pronotum; punctation defined and sparse (slightly less sparse in anterior portion), interstices on average at least twice as broad as diameter of punctures. Hind wings fully developed. Metatarsomere I approximately as long as the combined length of II–IV.

Abdomen (Fig. 145) approximately 0.95 times as broad as elytra and with rather shallow anterior impressions on

tergites III–V; anterior impressions of tergites III–V with few (ca. 4–5) non-setiferous punctures in the middle, laterally impunctate; tergites III–V each with a median pair of setiferous punctures at or near posterior margin and with two lateral setiferous punctures on either side, otherwise impunctate; tergite VI with a transverse row of approximately 10 non-setiferous punctures at anterior margin, six setiferous punctures at posterior margin, two lateral setiferous punctures on either side, otherwise impunctate, except for an occasional 1–2 punctures on disc; tergite VII in antero-median portion with a transverse patch of approximately 15–20 moderately dense fine non-setiferous punctures and with two irregular transverse rows of approximately 6 setiferous punctures in posterior half; tergite VIII with a few setiferous punctures in posterior fourth, impunctate in anterior three-fourths; integument without microsculpture and very glossy; posterior margin of tergite VII with palisade fringe.

♂: posterior margin of tergite VIII somewhat projecting in the middle, posterior margin of this projection weakly concave; sternite VIII somewhat longer than tergite VIII, its posterior margin weakly concave; median lobe of aedeagus 0.78–0.83 mm long and shaped as in Figs. 254–255.

♀: shape of tergite VIII as in male; posterior margin of sternite VIII truncate in the middle.

Comparative notes

Zyras nigronitens is distinguished from other congeners recorded from China particularly by the conspicuously glossy and uniformly black body strongly contrasting with the yellow legs, by the morphology of the antennae, the sparse punctation of the forebody, the distinctive punctation pattern of the abdomen, and by the morphology of the aedeagus.

Distribution and natural history

The species was found in two localities in the Meili Xue Shan and one in the Baima Shan in West Yunnan (Fig. 303). Most of the specimens were sifted from leaf litter and moss in mixed forests, one on a gravel stream bank, at altitudes of 2580–4500 m.

Zyras (Zyras) beijingensis Pace, 1993
(Figs. 50, 93–95, 151–152, 256–257, 304)

Zyras (Zyras) beijingensis Pace, 1993: 114.
Zyras (Zyras) restitutus Pace, 1993: 114 ff.; **n. syn.**

Type material examined

Z. beijingensis: Holotype ♂ [most of both antennae missing]: "China, Beijing, VIII:1982, Rougemont / Holotypus *Zyras beijingensis* m., det. R. Pace 1987 / *Zyras beijingensis* sp. n., det. R. Pace 1987 / *Zyras beijingensis* Pace, det. V. Assing 2015" (cRou).

Z. restitutus: Holotype ♀: "China, Sichoan [sic], Da Zu [= Dazhu], 28.IX.1985, Rougemont / Holotypus *Zyras restitutus* m., det. R. Pace 1987 / *Zyras restitutus* sp. n., det. R. Pace 1987 / *Zyras beijingensis* Pace, det. V. Assing 2015" (cRou).

Additional material examined

China: Gansu: 6 exs., W Longnan, Min Shan, 33°26′N, 104°36′E, 1470 m, deep cleft with scree, shrubs at N-slope, litter sifted, 5.VIII.2012, leg. Assing & Schülke (cAss, cSch); 4 exs., S Longnan, Min Shan, 33°05′N, 104°45′E, 1500 m, N-slope, macchia, litter and moss sifted, 6.VIII.2012, leg. Assing & Schülke (cAss, cSch). – Shaanxi: 1 ex., Micang Shan, 34 km S Hanzhong, 32°44′22″N, 106°51′55″E, 1460 m, W-slope, deciduous forest margin with bamboo, litter, grass, and moss sifted, 14.VIII.2012, leg. Assing (cAss); 1 ex., Qinling Shan, 95 km WSW Xian, river bank at road Zhouzhi–Foping, 33°53′N, 108°01′E, 1000 m, gravel bank with vegetation, 4.VII.2001, leg. Wrase (cSch); 1 ex., 31 km E Xian, Li Shan near Lintong, 34°20′N, 109°16′E, 1000–1200 m, dry mountain meadow, forest, 23.–25.VIII.1985, leg. Wrase (cAss). – Zhejiang: 1 ex., Hangzhou Pref., Tianmu Shan, 40 km WNW Linan, water reservoir, 30°21′N, 119°19′E, 300 m, litter between rocks, sifted, 17.VI.2007, leg. Wrase (cAss).

Comment

The original description of *Z. beijingensis* is based on a unique male from "Beijing", that of *Z. restitutus* on a single female from "Sichuan, Da Zu" (Pace 1993). Both holotypes were located in cRou, but note that Pace (1993) states that they are deposited in the Chinese Academy of Sciences, Beijing. An examination of the above type material, as well as of the additional material listed above revealed that both names refer to the same species. They were made available in the same article. Since the holotype of *Z. beijingensis* is a male, this name is designated as the senior name and *Z. restitutus* as its junior synonym. Nevertheless, the validity of *Z. beijingensis* is pending confirmation. A comparison with a male (in poor condition) and a female of *Z. fugax* (Sharp, 1888) from Japan suggests that *Z. beijingensis* may be a junior synonym of that name (see comparative notes below). However, more material in better condition of *Z. fugax* is needed to clarify this suspicion.

Redescription

Moderately small species; body length 4.5–6.3 mm; length of forebody 2.1–2.7 mm. Coloration: head black; pronotum bright-reddish; elytra black, often with the suture narrow dark-reddish (Figs. 93–95); abdomen (Figs. 151–152) with segments III–IV reddish, tergite IV sometimes more or less distinctly and more or less extensively infuscate in the middle; segments V–X dark-brown to blackish, with the anterior and posterior margins of tergites V–VII, and at least the anterior and posterior portion of paratergites V–VII reddish; legs pale-yellow; antennae (Fig. 50) blackish, often with antennomeres I–II and base of III reddish-brown to brown, and with antennomere XI partly or completely dark-reddish to brown; maxillary palpi pale-brown to dark-brown with yellowish terminal palpomere.

Head (Figs. 93–95) distinctly transverse, impunctate along middle; punctation in lateral dorsal portions moderately sparse and rather fine. Eyes slightly longer than postocular region in dorsal view. Antenna (Fig. 50) 1.5–1.7 mm long, rather massive, and strongly incrassate apically; antennomere IV distinctly transverse, nearly 1.5 times as broad as long; antennomeres V–X of gradually increasing width and approximately twice as broad as long; X as long as, or slightly longer than combined length of IX and X.

Pronotum (Figs. 93–95) 1.09–1.16 times as broad as long and 1.25–1.35 times as broad as head; punctation fine to moderately coarse, sparse to moderately dense, and nearly equally distributed; midline narrowly impunctate.

Elytra (Figs. 93–95) 0.75–0.80 times as long as pronotum; punctation moderately coarse and dense, denser anteriorly than posteriorly. Hind wings fully developed. Metatarsomere I approximately as long as the combined length of II–IV.

Abdomen (Figs. 151–152) as broad as, or slightly narrower than elytra, with rather shallow anterior impressions on tergites III–IV, tergite V without appreciable anterior impression; anterior impressions of tergites III–IV each with a transverse row, anterior portions of tergites V–VII each with a transverse band of non-setiferous punctures; tergite III with a lateral setiferous puncture on either side and with 8–10 fine setiferous punctures at posterior margin; tergites IV and V each with a median pair of punctures, with a lateral puncture on either side, and with 8–10 punctures at posterior margin; tergite VI with a median pair of punctures, a variable number of additional lateral punctures, and with 8–10 punctures at posterior margin; tergite VII with a variable number of punctures in whole posterior half, sometimes partly arranged in two transverse series, and with numerous fine punctures at posterior margin; tergite VIII with sparse punctation on whole surface; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe; posterior margin of tergite VIII with or without shallow concavity in the middle.

♂: sternite VIII longer than tergite VIII, its posterior margin strongly convex; median lobe of aedeagus approximately 0.7 mm long and shaped as in Figs. 256–257; apical lobe of paramere rather long and slender.

♀: posterior margin of tergite VIII shallowly concave in the middle.

Intraspecific variation

The male from Zhejiang is distinguished from the material seen from other regions by slight differences in the coloration of the forebody, the slightly more transverse pronotum with slightly sparser and finer punctation, and by slight differences in the shape of the median lobe of the aedeagus. Since these differences are only slight and in view of other pronounced similarities, they are attributed to intra- rather than interspecific variation.

Comparative notes

Zyras beijingensis is extremely similar to *Z. fugax* from Japan. The only differences observed between the material of *Z. beijingensis* examined and the two specimens of *Z. fugax* available for comparison are the slightly more incrassate antennae and the darker abdominal tergite V. In size, habitus, and coloration, *Z. beijingensis* is also similar to *Z. particornis* (Sharp, 1888), from which it is readily distinguished by the shorter, more massive, and much more strongly incrassate antennae, as well as by the different coloration of the antennae and the abdomen (*Z. particornis*: apical three antennomeres pale-yellowish; abdominal tergite V reddish).

Distribution and natural history

This species is currently known from the Chinese provinces Beijing, Shaanxi, Gansu, Sichuan, and Zhejiang (Fig. 304), but probably more widespread, as can be inferred from the relatively low altitudes (300–1500 m). The examined material was collected by sifting litter, moss, grass, and various debris in macchia, shrub habitats, in dry forest, at a forest margin, and on the banks of a reservoir and a stream.

Zyras (Zyras) pulcher **n. sp.**

(Figs. 51, 96, 150, 258–259, 305)

Type material

Holotype ♂: "China [17] – S-Gansu, S Longnan, Min Shan, macchia, 33°05′24″N, 104°45′13″E, 1500 m, 6.VIII.2012, V. Assing / Holotypus ♂ *Zyras pulcher* sp. n. det. V. Assing 2014" (cAss).

Paratypes: 1 ♀ [slightly teneral]: "China: S-Gansu [CH12-15], Min Shan, 30 km W Longnan, 33°26′19″N, 104°36′17″E, 1470 m, deep cleft with scree, shrubs at N-slope, litter sifted, 5.VIII.2012, M. Schülke" (cSch); 1 ♀ [slightly teneral]: "China – NW Sichuan, between Shangliusuo–Luhua, 5 km E of Luhua, 2400 m, shrubs, 7–28.VI.2004, leg. R. Fabbri" (cAss).

Etymology

The specific epithet (Latin, adjective: beautiful) alludes to the vivid and distinctive coloration of this species.

Description

Small species; body length 3.5–5.0 mm; length of forebody 1.7–2.2 mm. Coloration distinctive: head black; pronotum bright-reddish; elytra yellowish-red with sharply marked black spots in postero-lateral angles (Fig. 96); abdomen (Fig. 150) completely black; legs yellow; maxillary palpi dark-yellowish; antennae (Fig. 51) blackish-brown, with antennomere II somewhat paler brown.

Head (Fig. 96) distinctly transverse, broadly impunctate in median and posterior portions, in lateral and anterior portions with conspicuously sparse punctation; interstices several times as broad as diameter of punctures. Eyes longer than postocular region in dorsal view. Antenna (Fig. 51) 1.3–1.5 mm long and massive; antennomere IV distinctly transverse; V–X gradually increasing in width and increasingly transverse; X strongly transverse, more than 1.5 times as broad as long; XI approximately as long as the combined length of IX and X.

Pronotum (Fig. 96) relatively slender, approximately 1.12 times as broad as long and 1.3 times as broad as head; punctation sparse; interstices much broader than diameter of punctures; midline moderately broadly impunctate; lateral margins without long setae.

Elytra (Fig. 96) 0.81–0.82 times as long as pronotum; punctation defined and sparse, interstices much broader than diameter of punctures. Hind wings fully developed. Metatarsomere I slightly shorter than the combined length of II–IV.

Abdomen (Fig. 150) approximately 0.9 times as broad as elytra, slender, very weakly tapering posteriad, with shallow anterior impressions on tergites III–V, and with fine punctation; anterior impressions of tergites III–V and anterior portion of tergite VI with sparse non-setiferous punctation; posterior margins of tergites III–VII each with row of setiferous punctures; tergites III–V each with a pair of setiferous punctures in the middle (individual punctures may occasionally be missing) and a lateral setiferous puncture near paratergites on either side; disc of tergite VI with a transverse row of six setiferous punctures; tergite VII anteriorly with a few punctures and with three transverse rows of sparse punctures in posterior half; tergite VIII with sparse, somewhat more distinct setiferous punctures in posterior portion; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe.

♂: posterior margin of tergite VIII truncate in the middle; sternite VIII somewhat longer than tergite VIII, its posterior margin weakly convex in the middle; median lobe of aedeagus relatively small, 0.57 mm long and shaped as in Figs. 258–259.

♀: posterior margin of tergite VIII smoothly convex; posterior margin of sternite VIII convex.

Comparative notes

Aside from its distinctive coloration, *Z. pulcher* is characterized by the rather massive antennae, the conspicuously sparse punctation of the forebody, the punctation pattern of the abdomen, and by the morphology of the aedeagus.

Distribution and natural history

The species was discovered in two geographically close localities in the Min Shan, southern Gansu, and one in northwestern Sichuan (Fig. 305). The specimens from Gansu were sifted from debris and plant roots in macchia and in a deep cleft with sparse vegetation. The altitudes range from 1470 to 2400 m. The paratypes are slightly teneral.

Zyras (Zyras) schuelkei **n. sp.**

(Figs. 28, 90, 148, 260–261, 306)

Type material

Holotype ♂ [slightly teneral]: "China: Sichuan (2), Qingcheng-Shan, Rückseite, 650–700 m, 30.53.56N, 103.33.01E, 18.05.1997, M. Schülke / Holotypus ♂ *Zyras schuelkei* sp. n. det. V. Assing 2014" (cAss).

Paratype ♀: "China: Fujian prov., Wuyi Shan Nat. Res., Sangan [recte: Sangang] env. (900 m), 30.V.–12.VI.2001, Hlaváč & Cooter lgt." (cHla).

Etymology

This colourful species is dedicated to my friend and colleague Michael Schülke, who collected not only the holotype of this species, but also numerous specimens of other *Zyras* species treated in the present paper.

Description

Body length 6.8–8.5 mm; length of forebody 3.1–3.3 mm. Coloration: head blackish; pronotum bright-reddish; elytra yellowish, with sharply delimited black marking of triangular shape in postero-lateral portion (Fig. 90); abdomen (Fig. 148) black; legs pale-yellow; antennae (Fig. 28) blackish-brown, with antennomeres I–II and the basal half of III pale-reddish.

Head (Fig. 90) distinctly transverse, broadly impunctate in median and posterior portions, in lateral and anterior portions with sparse punctation; interstices distinctly broader than diameter of punctures. Eyes large, distinctly longer than postocular region in dorsal view. Antenna (Fig. 28) long and slender, 2.5–2.6 mm long; antennomeres IV–V weakly oblong; VI–VII approximately as long as broad; VIII–IX weakly transverse; X nearly 1.5 times as long as broad; XI long and apically acute, longer than the combined length of IX and X.

Pronotum (Fig. 90) approximately 1.15 times as broad as long and 1.15 times as broad as head; punctation sparse and irregularly spaced; interstices much broader than diameter of punctures; midline narrowly impunctate; lateral margins with few long black setae.

Elytra (Fig. 90) 0.9 times as long as pronotum; punctation defined and moderately dense, interstices on average broader than diameter of punctures. Hind wings fully developed. Metatarsomere I approximately as long as the combined length of II–IV.

Abdomen (Fig. 148) approximately 0.9 times as broad as elytra, slender, weakly tapering posteriad, with shallow anterior impressions on tergites III–V; anterior impressions

of tergites III–V and anterior portion of tergite VI with rather sparse non-setiferous punctation; tergite III with a median pair of setiferous punctures on disc, otherwise practically impunctate, posterior margin impunctate; tergite IV impunctate in posterior half, except for a median pair of setiferous punctures at hind margin; tergites V–VI each with two lateral punctures on either side and with four setiferous punctures at posterior margin, otherwise impunctate in posterior half; tergite VII with several setiferous punctures at posterior margin, with a median pair of punctures, and with few lateral punctures, otherwise impunctate; tergite VIII with a few punctures in posterior portion; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe.

♂: median pair of punctures on tergite VII and punctures in posterior portion of tergite VIII somewhat granulose; posterior margin of tergite VIII concave in the middle, on either side of this concavity dentate; sternite VIII somewhat longer than tergite VIII, its posterior margin convex; median lobe of aedeagus 0.75 mm long; ventral process distinctly bent subapically in lateral view (Figs. 260–261).

♀: posterior margin of tergite VIII concave in the middle, but not dentate on either side of concavity.

Comparative notes

Zyras schuelkei is distinguished from the similarly coloured *Z. pulcher* by numerous characters, particularly its much larger body size, the more transverse head with larger and more bulging eyes, the much longer and more slender antennae, the relatively smaller pronotum (in relation to the head), the much more coarsely and more densely punctured elytra, the larger and more defined dark markings on the elytra, the punctation pattern of the abdomen, and by the shape of the larger aedeagus.

Distribution and natural history

The species is known from two localities, one in the Qingcheng Shan, Sichuan, and one in the Wuyi Shan, Fujian (Fig. 306). The altitudes range from approximately 700 to 900 m. The holotype is slightly teneral.

Zyras (Zyras) discolor **n. sp.**

(Figs. 52, 91, 149, 262–263, 303)

Type material

Holotype ♂: "China: Fujian prov., Wuyi Shan Nat. Res., Guadun hill, (900–1300), 1.–2.VI.2001, Hlaváč & Cooter lgt. / Sifting bamboo forest / Holotypus ♂ *Zyras discolor* sp. n. det. V. Assing 2014" (cHla).

Paratypes: 1 ♀: same data as holotype (cHla); 1 ♂ [slightly teneral], 1 ♀: "China: Fujian prov., Wuyi Shan Nat. Res., Sangan env. (900 m), 30.v.–12.vi.2001, Hlaváč & Cooter lgt." (cAss).

Etymology

The specific epithet (Latin, adjective: colourful) alludes to the vivid and distinctive coloration of this species.

Description

Body length 5.8–7.0 mm; length of forebody 2.5–3.0 mm. Coloration: forebody blackish-brown (Fig. 91); abdomen (Fig. 149) distinctly bicoloured, with segments III–VI bright-reddish and segments VII (except for the reddish anterior margin) and VIII dark-brown; legs yellow; maxillary palpi yellowish to brown; antennae (Fig. 52) dark-reddish to brown, with antennomeres I–II and the apical antennomeres more or less extensively reddish.

Head (Fig. 91) distinctly transverse, broadly impunctate in median portion, in lateral portions with few scattered coarse punctures; interstices several times as broad as diameter of punctures. Eyes longer than postocular region in dorsal view. Antenna (Fig. 52) 2.0–2.2 mm long and rather slender; antennomeres IV–VI as long as broad or very weakly transverse; V–X only indistinctly increasing in width; X weakly transverse, less than 1.5 times as broad as long; XI approximately as long as the combined length of IX and X, or nearly so.

Pronotum (Fig. 91) relatively slender, approximately 1.09–1.13 times as broad as long and 1.19–1.27 times as broad as head; punctation sparse and coarse; interstices on average much broader than diameter of punctures; midline narrowly impunctate; lateral margins with few very long black setae.

Elytra (Fig. 91) 0.89–0.90 times as long as pronotum; punctation defined and sparse, denser in anterior than in posterior portion; interstices in posterior portion on average more than twice as broad as diameter of punctures. Hind wings fully developed. Metatarsomere I approximately as long as the combined length of II–IV.

Abdomen (Fig. 149) approximately 0.95 times as broad as elytra, slender, with rather deep anterior impressions on tergites III–V; setiferous punctures with long dark setae; anterior impressions of tergites III–V and anterior portion of tergite VI with dense and coarse non-setiferous punctation; tergites III–IV with a median pair of setiferous punctures (near posterior margin), with two lateral setiferous punctures on either side, and without punctures at posterior margin; tergite V with a median pair of setiferous punctures, with two lateral setiferous punctures on either side, and with four setiferous punctures at posterior margin; tergite VI with transverse row of 6 setiferous punctures on disc and 6 setiferous punctures at (or near) posterior margin; tergite VII with some non-setiferous punctures near anterior margin and with approximately 20 setiferous punctures indistinctly arranged in two irregular transverse rows in posterior portion of disc, without setae at posterior margin; tergite VIII in posterior fourth with approximately 20 setiferous punctures, in anterior three-

fourths impunctate; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe.

♂: posterior margin of tergite VIII shallowly and angularly excised in the middle; sternite VIII somewhat longer than tergite VIII, its posterior margin convex; median lobe of aedeagus 0.72–0.75 mm long and shaped as in Figs. 262–263; ventral process long and apically very acute.

♀: posterior margin of tergite VIII smoothly convex; posterior margin of sternite VIII weakly concave in the middle.

Comparative notes

Aside from its distinctive coloration, *Z. discolor* is characterized by the coarse punctation of the whole body, the slender antennae, the long setae on the pronotum and abdomen, the shape of the posterior excision of the male tergite VIII, and by the morphology of the aedeagus.

Distribution and natural history

The species was found in two geographically close localities in the Wuyi Shan, Fujian (Fig. 303), at elevations between 900 and 1300 m. Two specimens were sifted in a bamboo forest. One of the paratypes is teneral.

Zyras (Zyras) bicoloricollis **n. sp.**

(Figs. 53, 92, 153, 270–271, 305)

Type material

Holotype ♂: "China [15] – Yunnan, valley S Gejiu, road margin, 23°08′38″N, 103°11′42″E, 1010 m, 21.VIII.2014, V. Assing / Holotypus ♂ *Zyras bicoloricollis* sp. n. det. V. Assing 2015" (cAss).

Paratypes: 1♂: same data as holotype (cAss); 1♀: "China: Yunnan, valley S Gejiu, 23°08′53″N, 103°10′58″E, 1250 m, field margin with shrubs, litter and soil between stones sifted, 21.VIII.2014, Schülke [CH14-16]" (cSch).

Etymology

The specific epithet (adjective) alludes to the indistinctly bicoloured pronotum.

Description

Body length 5.3–7.0 mm; length of forebody 2.5–3.1 mm. Coloration: head dark reddish-brown, with the frons and the mouthparts reddish; pronotum indistinctly bicoloured: disc dark-brown, margins rather narrowly and postero-lateral portion more extensively dark-reddish; elytra pale-reddish, with the postero-lateral portions extensively blackish-brown (Fig. 92); abdomen (Fig. 153) with tergite III reddish, tergite IV reddish or brown, and tergites V–VII blackish-brown with reddish anterior portions (including anterior portions of paratergites) and with the posterior margins of tergites V–VI narrowly reddish; legs yellowish; antennae (Fig. 53) blackish, with antennomeres I–II and base of III reddish and with antennomere XI pale-yellowish; maxillary palpi reddish.

Head (Fig. 92) distinctly transverse, broadly impunctate in median portion, in lateral portions with few scattered moderately coarse punctures; interstices several times as broad as diameter of punctures. Eyes distinctly longer than postocular region in dorsal view. Antenna (Fig. 53) 1.8–2.0 mm long; antennomeres IV–V as long as broad or very weakly transverse; VI–X only indistinctly increasing in width and weakly transverse; X less than 1.5 times as broad as long; XI approximately as long as the combined length of IX and X.

Pronotum (Fig. 92) 1.14–1.18 times as broad as long and 1.20–1.28 times as broad as head; punctation sparse, rather coarse, and equally distributed; interstices on average much broader than diameter of punctures; midline rather narrowly impunctate; lateral margins each with four very long black setae (often broken off).

Elytra (Fig. 92) 0.87–0.90 times as long as pronotum; punctation defined and sparse, very sparse in posterior and postero-sutural portion; interstices in median portion of disc on average approximately twice as broad as diameter of punctures. Hind wings fully developed. Metatarsomere I approximately as long as, or even longer than the combined length of II–IV.

Abdomen (Fig. 153) slightly narrower than elytra, slender, with moderately deep anterior impressions on tergites III–V; anterior impressions of tergites III–V and anterior portion of tergite VI with dense non-setiferous punctation; tergite III with a lateral puncture and a latero-marginal puncture on either side and with a pair of median punctures near posterior margin; tergites IV and V without a median pair of punctures; tergite IV with a lateral puncture on either side and with four punctures at posterior margin; tergites V–VI with a lateral puncture on either side and with six punctures at posterior margin; tergite VI with or without a median pair of punctures (in the female paratype only one puncture is present); tergite VII with few scattered non-setiferous punctures in antero-median portion and with two transverse rows of setiferous punctures in posterior portion; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe; posterior margin of tergite VIII with shallow concavity in the middle.

♂: sternite VIII somewhat longer than tergite VIII, its posterior margin convex; median lobe of aedeagus approximately 0.6 mm long and shaped as in Figs. 270–271.

♀: posterior margin of sternite VIII distinctly concave in the middle.

Comparative notes

This species is distinguished from other Chinese representatives of the subgenus by its coloration alone. In addition, it is characterized by the sparse punctation of the

forebody, the punctation pattern of the abdomen, and by the shape of the median lobe of the aedeagus.

Distribution and natural history

The type specimens were collected in two adjacent localities to the south of Gejiu, southeastern Yunnan (Fig. 305). They were sifted from litter and soil at a road margin and at a field margin at altitudes of 1010 and 1250 m.

Zyras (Zyras) bisinuatus **n. sp.**
(Figs. 29, 98, 155, 266–267, 304)

Type material

Holotype ♂: "China [12a] – Yunnan, mt. WNW Wuding, mix. forest, 25°38′45″N, 102°06′55″E, 2390 m, 1.IX.2014, V. Assing / Holotypus ♂ *Zyras bisinuatus* sp. n. det. V. Assing 2015" (cAss).

Paratypes: 1♂: same data as holotype (cAss); 1♂: "China [18] – Yunnan, mts S Jianshui, broad-leaved for., 23°25′20″N, 102°51′05″E, 1890 m, 22.VIII.2014, V. Assing" (cAss); 1♀: "China [22] – Yunnan, SE Pingbian, primary forest, 22°54′31″N, 103°41′44″E, 2100 m, 27.VIII.2014, V. Assing" (cAss); 1♀: same data, but "[22a] … 28.VIII.2014" (cAss); 2♂♂: same data, but leg. Schülke (cSch, cAss).

Etymology

The specific epithet (adjective) alludes to the bisinuate ventral process and the bisinuate crista apicalis of the median lobe of the aedeagus (lateral view).

Description

Species of slender habitus. Body length 6.5–7.7 mm; length of forebody 3.0–3.1 mm. Coloration: head and pronotum blackish-brown to blackish; elytra bicoloured, blackish, with the anterior third and the suture dark-yellowish (Fig. 98); abdomen (Fig. 155) with tergite III reddish (rarely weakly infuscate in the middle), tergite IV reddish with the middle more or less infuscate, tergites V–VI reddish with the middle extensively infuscate, tergite VII blackish-brown to blackish with the anterior and lateral portions more or less broadly and the posterior margin sometimes narrowly reddish, and tergite VIII blackish-brown to blackish with the anterior portion broadly reddish and usually the apex somewhat dark-reddish; legs pale-yellowish, with the apical $^1/_3$–$^2/_5$ of the metafemora distinctly infuscate and the apices of the mesofemora more weakly and less extensively infuscate; antennae (Fig. 29) dark-brown to blackish brown, with the basal 2–3 antennomeres reddish and the apical 2–3 antennomeres yellowish; maxillary palpi reddish with at least the apical half of palpomere III, usually with all of palpomeres II and III dark-brown to blackish-brown.

Head (Fig. 98) distinctly transverse, broadly impunctate in median portion, in lateral portions with sparse coarse punctation. Eyes longer than postocular region in dorsal view. Antenna (Fig. 29) long and slender, 2.4–2.6 mm long; antennomeres IV–VII oblong (rarely VII as long as broad), VIII approximately as broad as long, IX–X weakly transverse, and XI approximately as long as the combined length of IX and X.

Pronotum (Fig. 98) weakly transverse, 1.05–1.10 times as broad as long and approximately 1.3 times as broad as head; punctation coarse, moderately dense to dense, and more or less equally distributed; interstices on average narrower than, more rarely approximately as broad as diameter of punctures; midline with or without narrow impunctate band; lateral margins each with four long black setae (often broken off).

Elytra (Fig. 98) 0.80–0.85 times as long as pronotum; punctation coarse and defined, rather dense in anterior half, sparse in posterior portion. Hind wings fully developed. Legs long and very slender; metatarsomere I approximately as long as, or even longer than the combined length of II–IV.

Abdomen (Fig. 155) slightly narrower than elytra, slender, with deep anterior impressions on tergites III–V; anterior impressions of tergites III–V and anterior portion of tergite VI with rather coarse and somewhat weakly defined non-setiferous punctation; tergite III with a transverse row of setiferous punctures near posterior margin; tergite IV with a transverse row of setiferous punctures near posterior margin and with an additional lateral puncture on either side; tergite V with six marginal setiferous punctures and an additional lateral puncture on either side; tergite VI with 8 marginal setiferous punctures and an additional lateral puncture on either side; tergite VII with few scattered non-setiferous punctures in anteromedian portion and with two transverse rows of setiferous punctures in posterior portion; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe; posterior margin of tergite VIII with distinct concavity in the middle.

♂: sternite VIII somewhat longer than tergite VIII, its posterior margin convex, in the middle truncate or nearly so; median lobe of aedeagus 0.87–0.93 mm long and of distinctive shape: ventral process long, bisinuate in lateral view, and apically convex in ventral view; crista apicalis bisinuate in lateral view (Figs. 266–267).

Comparative notes

This distinctive species is characterized particularly by the coloration, the slender habitus, a weakly transverse pronotum, the coarse punctation of the pronotum and elytra, the punctation pattern of the abdomen, and above all by the conspicuous shape of the aedeagus.

Distribution and natural history

The type specimens were collected in three localities in eastern and southeastern Yunnan (Fig. 304). They were

sifted from leaf litter in a mixed forest margin with alder and pine, in a subtropical broad-leaved forest, and in a primary subtropical broad-leaved forest at altitudes of 1890–2390 m.

Zyras (Zyras) fratrumkadooriorum Pace, 1998
(Figs. 43, 97, 154, 272–273, 304)

Zyras (Zyras) fratrumkadooriorum Pace, 1998: 968.

Type material examined

Paratypes: 2 ♂♂, 1 ♀ [originally on one pin]: "Hong Kong, Tai Po, VII.1996, G. de Rougemont / Paratypi *Zyras fratrumkadooriorum* m., det. R. Pace 96 / *Zyras fratrumkadooriorum* Pace, det. V. Assing 2015" (cRou, cAss).

Comment

The original description is based on eleven type specimens from "Hong Kong, Kadoorie Farm" collected in VI.1991 and VII.1992 by G. Ades and in V.1996, VIII.1996, and IX.1996 by G. de Rougemont (Pace 1998).

Description

Small species; body length 4.3–5.0 mm; length of forebody 1.9–2.1 mm. Coloration: head blackish; pronotum blackish-brown; elytra yellowish, with the posterolateral portions extensively blackish (Fig. 97); abdomen (Fig. 154) bicoloured, with segments III–V pale-reddish and segments VI–X dark-brown; legs pale-yellowish; antennae (Fig. 43) blackish-brown with antennomeres I–II and base of antennomere III reddish; maxillary palpi pale reddish-brown.

Head (Fig. 97) distinctly transverse, broadly impunctate in median and posterior portions; punctation in lateral dorsal portions moderately coarse and very sparse. Eyes large, much longer than postocular region in dorsal view. Antenna (Fig. 43) 1.7–1.8 mm long; antennomeres IV–V weakly oblong, VI–VII approximately as broad as long, VIII–X weakly transverse, X less than 1.5 times as broad as long, and XI conspicuously long, approximately as long as the combined length of VIII–X.

Pronotum (Fig. 97) weakly transverse and small in relation to head, approximately 1.1 times as broad as long and only approximately 1.13 times as broad as head; disc with rather few scattered, irregularly spaced, and moderately coarse punctures, without distinct impunctate band along middle.

Elytra (Fig. 97) approximately 0.85 times as long as pronotum; punctation rather coarse, defined, and moderately dense, interstices on average broader than diameter of punctures. Hind wings fully developed. Metatarsomere I approximately as long as the combined length of II–IV.

Abdomen (Fig. 154) narrower than elytra, with moderately deep anterior impressions on tergites III–V; anterior impressions of tergites III–V each with a row of rather ill-defined and shallow non-setiferous punctures; tergites III–VI each with a lateral puncture on either side and with six punctures at posterior margin; tergites VI and VII completely without non-setiferous punctures anteriorly; tergite VII with very few scattered fine punctures in posterior portion; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe; posterior margin of tergite VIII with very shallow median concavity.

♂: sternite VIII somewhat longer than tergite VIII, its posterior margin convex; median lobe of aedeagus 0.57 mm long; ventral process straight in lateral view, weakly curved apically (Figs. 272–273).

Comparative notes

Zyras fratrumkadooriorum is distinguished from other Chinese representatives of the subgenus of similar coloration particularly by its small size, the long antennomere XI, the small pronotum (in relation to head), the scattered and irregularly spaced punctation of the pronotum, the distinctive punctation of the abdomen (tergites III–V without median pair of punctures; tergites VI and VII anteriorly without non-setiferous punctures), and by the shape of the median lobe of the aedeagus.

Distribution and natural history

This species is currently known only from Hong Kong (Fig. 304). Some of the type specimens were collected with a Malaise trap, others with flight interception traps, and one with a yellow pan trap (Rougemont 2001).

Zyras (Zyras) song Pace, 1993
(Figs. 32, 102, 159, 305)

Zyras (Zyras) song Pace, 1993: 112.

Type material examined

Holotype ♂: "China X.1986, Yunnan: Dali 2100 m, G. de Rougemont / Holotypus *Zyras song* mihi, det. R. Pace 1987 / *Zyras song* sp. n., det. R. Pace 1987 / *Zyras song* Pace, det. V. Assing 2015" (cRou).

Comment

The original description is based on a male holotype and a female paratype from "Yunnan, Dali" (Pace 1993).

Redescription

Body length 4.3 mm; length of forebody 2.2 mm. Coloration: head blackish; pronotum pale-reddish; elytra blackish (Fig. 102); abdomen with segments III–V reddish,

segment VI reddish, with the postero-median portion of tergite VI infuscate; segments VII–VIII blackish-brown; legs bicoloured: tarsi yellowish; profemora dark-brown; protibiae brown, with the external faces paler; meso- and metafemora with the basal halves pale-yellowish and the apical halves blackish; meso- and metatibiae pale-yellowish with the bases and the apices weakly and narrowly infuscate; antennae (Fig. 32) with antennomeres I–III dark-brown, IV pale-brown; V–VI dark-yellowish, and VII–XI pale-yellowish; maxillary palpi blackish-brown with the terminal palpomere yellowish.

Head (Fig. 102) distinctly transverse, broadly impunctate in median portion, in lateral portions with very sparse and fine punctation. Eyes slightly longer than postocular region in dorsal view. Antenna (Fig. 32) 2.0 mm long; antennomeres IV–VI weakly oblong, VII approximately as broad as long, VIII–X weakly transverse, X distinctly less than 1.5 times as broad as long, and XI approximately as long as the combined length of IX and X.

Pronotum (Fig. 102) weakly transverse, 1.1 times as broad as long and 1.15 times as broad as head; lateral margins not distinctly sinuate in posterior half (dorsal view); disc with scattered, sparse, irregularly spaced, shallow, and very fine punctures; lateral margins each with four long black setae, antero-lateral portion with additional long black setae.

Elytra (Fig. 102) 0.87 times as long as pronotum; punctation rather fine and sparse, less sparse in anterior than in posterior half; interstices much broader than diameter of punctures. Hind wings fully developed. Metatarsomere I distinctly shorter than the combined length of II–IV.

Abdomen (Fig. 159) narrower than elytra, with moderately deep anterior impressions on tergites III–V; anterior impressions of tergites III–V with fine, shallow, and weakly defined non-setiferous punctation; tergite III without median pair of punctures, with a lateral puncture on either side, and with 8 punctures at posterior margin; tergite IV with a median pair of punctures, with a lateral puncture on either side, and with 8 punctures at posterior margin; tergite V with a median pair of punctures, with two lateral punctures on either side, and with 10 punctures at posterior margin; tergite VI anteriorly with a narrow transverse band of non-setiferous punctures, with a median pair of punctures, with two lateral punctures on either side, and with approximately 10 punctures at posterior margin; tergite VII with non-setiferous punctures in antero-median portion and with few scattered setiferous punctures not arranged in distinct series in posterior portion; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe; posterior margin of tergite VIII convex, not concave in the middle.

♂: median lobe of aedeagus 0.6 mm long, shaped as illustrated by Pace (1993); paramere with slender apical lobe.

Comparative notes

Among the species with a similarly bicoloured body, *Z. song* is characterized particularly by the colour of the antennae (five terminal antennomeres pale-yellowish) and the coloration of the legs, additionally also by the sparse punctation of the head and pronotum, the less elongate metatarsomere I, the punctation pattern of the abdomen, and the shape of the median lobe of the aedeagus.

Distribution

The species is currently known only from the type locality, which is situated in northwestern Yunnan (Fig. 305). The type specimens were collected at an altitude of 2100 m.

Zyras (Zyras) exspoliatus **n. sp.**

(Figs. 31, 103, 160, 264–265, 293–294, 305)

Type material

Holotype ♂: "China, Guangxi, Diding, 8.VII.99, J. R. Fellowes leg. / *Zyras song* Pace, det. 2002, G. de Rougemont / Holotypus ♂ *Zyras exspoliatus* sp. n., det. V. Assing 2015" (cAss).

Etymology

The specific epithet (Latin, adjective: robbed, stripped) alludes to the absence of median pairs of punctures on the abdominal tergites III–V.

Description

Body length 6.3 mm; length of forebody 2.6 mm. Coloration: head blackish; pronotum pale-reddish; elytra blackish, except for the dark-reddish suture (Fig. 103); abdomen (Fig. 160) with segments III–V reddish, tergite VI blackish, except for the reddish paratergites and the reddish anterior and antero-lateral portions; segments VII–VIII blackish; legs pale-yellowish, with the profemora and the apical halves of the meso- and metafemora brown; antennae (Fig. 31) blackish-brown, with antennomere XI dark-yellowish; maxillary palpi dark-brown with the terminal palpomere yellowish.

Head (Fig. 103) distinctly transverse, broadly impunctate in median portion, in lateral portions with very sparse and fine punctation. Eyes much longer than postocular region in dorsal view. Antenna (Fig. 31) 2.3 mm long; antennomeres IV–V distinctly oblong, VI–VII weakly oblong; VIII approximately as broad as long, IX–X weakly transverse, X slightly less than 1.5 times as broad as long, and XI approximately as long as the combined length of IX and X.

Pronotum (Fig. 103) weakly transverse, 1.07 times as broad as long and 1.2 times as broad as head; lateral margins weakly sinuate in posterior half (dorsal view); disc

with rather sparse, irregularly spaced, shallow, and somewhat ill-defined punctures; lateral margins without long black setae in holotype, but probably broken off (setiferous punctures present).

Elytra (Fig. 103) 0.78 times as long as pronotum; punctation moderately fine and moderately dense, not distinctly sparser posteriorly than anteriorly; interstices much broader than diameter of punctures. Hind wings fully developed. Metatarsomere I slightly longer than the combined length of II–IV.

Abdomen (Fig. 160) as broad as elytra, with rather deep anterior impressions on tergites III–V; anterior impressions of tergites III–V with fine, shallow, and weakly defined non-setiferous punctation; tergites III–VI without median pairs of punctures; tergite III with a lateral puncture on either side, and with 4 punctures at posterior margin; tergites IV–V each with a lateral puncture on either side and with 6 punctures at posterior margin; tergite VI anteriorly with a slightly irregular transverse series (not a band) of non-setiferous punctures anteriorly, with a lateral puncture on either side, and with a series of punctures at posterior margin; tergite VII with approximately 15 non-setiferous punctures anteriorly and with very sparse setiferous punctures not arranged in distinct series in posterior portion; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe; posterior margin of tergite VIII indistinctly concave in the middle (Fig. 293).

♂: sternite VIII much longer than sternite VIII, its posterior margin nearly truncate in the middle (Fig. 294); median lobe of aedeagus 0.75 mm long and shaped as in Figs. 264–265; paramere with slender apical lobe.

Comparative notes

Zyras exspoliatus is distinguished from the similar *Z. song* by the different coloration of the antennae, the legs, the suture, and abdominal tergite VI, by the denser punctation of the pronotum, the broader pronotum (in relation to head), the shorter elytra, the longer metatarsomere I, the sparser punctation of the abdomen (particularly the absence of pairs of median punctures on tergites IV–VI), and by the larger and differently shaped median lobe of the aedeagus.

Distribution

The type locality is situated in Guangxi province, South China (Fig. 305). Additional information is not available.

Zyras (Zyras) yongshengensis Pace, 2012
(Figs. 104, 161, 305)

Zyras (Zyras) yongshengensis Pace, 2012a: 86.

Type material examined

Holotype ♂ [damaged; antennomeres V–XI of left antenna and VII–XI of right antenna missing]: "China: N-Yunnan, Lijiang Naxi Aut. Co. 3 km NW Yongsheng 53 km WSW Lijiang, 26°41.8′N, 100°43.1′E 1990 m, 14.VIII.2003 A. Smetana [C122] / Holotypus *Zyras yongshengensis* det. R. Pace 2005 / *Zyras yongshengensis* n. sp., det. R. Pace 2005 / coll. DEI Müncheberg / *Zyras yongshengensis* Pace, det. V. Assing 2015" (SDEI).

Comment

According to the original description, which is based on a unique male holotype from "China: N.Yunnan, Lijiang, Naxi Co., 3 km NW Yongsheng, 53 km WSW Lijiang, 26°41.8′N, 100°43.1′E", *Z. yongshengensis* has completely reduced hind wings (Pace 2012a). Indeed, the holotype does not possess hind wings, but the presence of a fully developed palisade fringe at the posterior margin of tergite VII suggests that the wings may have been removed in the process of mounting the specimen. Moreover, according to Pace (2012a), the eyes are shorter than the temples and the head lacks punctation. An examination of the holotype, however, revealed that the eyes are distinctly longer than the postocular region and the lateral dorsal portion of the head is sparsely punctate.

Redescription

Body length 5.7 mm; length of forebody 2.4 mm. Coloration: head blackish; pronotum pale-reddish; elytra blackish, with the suture reddish (Fig. 104); abdomen (Fig. 161) with segments III–VI pale-reddish, segment VII blackish-brown with the anterior margin, the antero-lateral portion, and the paratergites pale-reddish, and segments VIII–X blackish-brown; legs pale-yellowish, with the profemora pale-brown and the apical halves of the meso- and metafemora dark-brown; antennomeres I–VI dark-brown (remainder missing in holotype); maxillary palpi yellowish-brown, with the terminal palpomere yellowish.

Head (Fig. 104) distinctly transverse, broadly impunctate in median portion, in lateral portions with sparse and fine punctation. Eyes longer than postocular region in dorsal view. Antenna with antennomeres IV–V distinctly oblong and VI very weakly oblong.

Pronotum (Fig. 104) weakly transverse, approximately 1.1 times as broad as long and 1.2 times as broad as head; lateral margins not sinuate in posterior half (dorsal view); disc with scattered, sparse, irregularly spaced, shallow, and rather fine punctures; lateral margins each with four long black setae, antero-lateral portion with additional long black setae.

Elytra (Fig. 104) conspicuously short, 0.65 times as long as pronotum; punctation coarse, denser in anterior than in posterior half; interstices in posterior half much broader than diameter of punctures. Hind wings: see comment above. Legs long and very slender; metatarsomere I approximately as long as the combined length of II–IV.

Abdomen (Fig. 161) approximately as broad as elytra, with rather deep anterior impressions on tergites III–V; anterior impressions of tergites III–V with fine, shallow, and weakly defined non-setiferous punctation; tergites III–V without median pair of punctures; tergite III with a lateral puncture on either side and with 4 punctures at posterior margin; tergite IV with a lateral puncture on either side and with 8 punctures at posterior margin; tergite V with a lateral pair of punctures on either side and with 8 punctures at posterior margin; tergite VI with a narrow transverse band of non-setiferous punctures anteriorly, a lateral setiferous puncture on either side, and 8 punctures near posterior margin; tergite VII with numerous non-setiferous punctures in antero-median portion and with scattered fine setiferous punctures not arranged in distinct series in posterior portion; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe; posterior margin of tergite VIII convex, not concave in the middle.

♂: median lobe of aedeagus 0.68 mm long, shaped as illustrated by Pace (2012a); paramere with slender apical lobe.

Comparative notes

This species is readily distinguished from all other Chinese representatives of the subgenus by the short elytra alone.

Distribution and natural history

Zyras yongshengensis is currently known only from the type locality, which is situated in northwestern Yunnan (Fig. 305). The holotype was collected at an altitude of nearly 2000 m, most likely by sifting leaf litter.

Zyras (Zyras) hongkongensis Pace, 1999
(Figs. 33, 99, 157, 274–277, 295–297, 306)

Zyras (Zyras) hongkongensis Pace, 1999: 684 ff.
Zyras (Zyras) benenensis Pace, 2001: 196 f.; **n. syn.**

Type material examined

Z. hongkongensis: Paratype ♀: "Hong Kong, Tai Long, G. Reels, 11.III.1997 / At light / Paratypus *Zyras hongkongorum* [sic] m., det. R. Pace 1998 / *Zyras hongkongorum* sp. n., det. R. Pace 1999 / *Zyras hongkongensis* Pace, det. V. Assing 2015" (cRou).

Z. benenensis: Holotype ♂: "Vietnam-N, 100 km SSW Hanoi, 40 km SW Than Hoa, Ben En Nat. Park, 50 m, 29.–30.1997, leg.: A. Napolov / Holotypus *Zyras benenensis* mihi, det. R. Pace 2001 / *Zyras benenensis* mihi, det. R. Pace 2001 / *Zyras hongkongensis* Pace, det. V. Assing 2015" (NME).

Additional material examined

China: 1 ♀, Yunnan, Xishuangbanna, Menglun, 500 m, at light, 4.–7.XI.1999, leg. Jäch et al. (NHMW); 7 exs., Guangxi, Shiwandashan National Forest Park, 21°54′N, 107°54′E, 290–360 m, forested river valley, at light, 5.–9.IV.2013, leg. Fikáček et al. (NMP, cAss); 1 ♀, Guangdong, W Qixing, Heishiding nature reserve, 23°28′N, 111°54′E, 190 m, forested stream valley, at light, 1.–3.V.2011, leg. Fikáček & Hájek (NMP).

Hong Kong: 1 ♀, Lung Kwachao [?], at light, 16.X.1997, leg. Reels (cRou).

Taiwan: 1 ♂, "Kosempo" [=Chia-hsien; 23°05′N, 120°35′E], leg. Sauter (FMNH).

India: 1 ♂, border region Assam-Arunachal Pradesh, Bhalukpong, 27°01′N, 92°39′E, 150 m, 1.–8.V.2012, leg. Dembický (NHMB).

Vietnam: 4 exs., Cuc Phuong National Park, 100 km S Hanoi, 2.–12.V.1991, leg. Jendek (NHMW, cAss); 5 exs., Cuc Phuong, 2.–11.V.1991, leg. Strnad (NMP, cAss); 1 ex., Sapa (Lao Cai), 22°20′N, 103°50′E, 25.V.–10.VI.1991, leg. Jendek (NHMW).

Indonesia: 2 ♂♂, Sumatra, leg. Schultheiss (FMNH); 1 ♂, Sumatra, Tebing Tinggi, leg. Schultheiss (FMNH); 1 ♂, Java Barat, Bandung, 1908, leg. Roepke (FMNH).

Comment

The original description of *Z. hongkongensis* is based on a male holotype and two female paratypes from "Hong Kong, Tai Long" (Pace 1999). In the description of *Z. benenensis*, Pace (2001) compares the species with *Z. chinkiangensis* and *Z. song*, but there is no reference to *Z. hongkongensis*. A comparison of the holotype of *Z. benenensis* with the paratype and non-type material of *Z. hongkongensis* revealed no differences whatsoever, neither in external nor in the male sexual characters, suggesting that both names refer to the same species. Consequently, *Z. benenensis* is placed in synonymy with the senior name *Z. hongkongensis*. The additional material from Taiwan and Indonesia had been identified as *Z. geminus* (Kraatz, 1859) by Bernhauer.

Redescription

Body length 5.2–7.2 mm; length of forebody 2.9–3.2 mm. Coloration: head and elytra black; pronotum bright-reddish (Fig. 99); abdomen (Fig. 157) with segments III–V pale-reddish, tergite VI black, with the narrow anterior margin and the antero-lateral portions reddish, and tergites VII–VIII black; legs yellowish, with the apices of the meso- and metafemora, often also those of the profemora, more or less distinctly infuscate; antennae (Fig. 33) blackish with antennomeres XI or X–XI yellowish and with antennomere IX often somewhat paler brown, sometimes only with the basal 4–5 antennomeres blackish and the intermediate antennomeres gradually becoming paler towards antennal apex; maxillary palpi with palpomeres II and III brown to dark-brown and the terminal palpomere yellowish to reddish.

Head (Fig. 99) distinctly transverse, broadly impunctate in median portion, in lateral portions with sparse and very fine punctation. Eyes much longer than postocular region in dorsal view. Antenna (Fig. 33) 2.0–2.1 mm

long; antennomere IV approximately as broad as long, V weakly transverse, VI–X of gradually increasing width and increasingly transverse, X nearly twice as broad as long, and XI nearly as long as the combined length of IX and X.

Pronotum (Fig. 99) weakly transverse and rather small in relation to head, 1.06–1.10 times as broad as long and about 1.15 times as broad as head; lateral margins weakly sinuate in posterior half (dorsal view); punctation rather fine and rather dense; midline moderately broadly impunctate; lateral margins and antero-lateral portions with long black setae (mostly broken off in the examined material).

Elytra (Fig. 99) approximately 0.85 times as long as pronotum; punctation extremely fine. Hind wings fully developed. Legs long and very slender; metatarsomere I approximately as long as, or even longer than the combined length of II–IV.

Abdomen (Fig. 157) approximately as broad as elytra, with deep anterior impressions on tergites III–V; anterior impressions of tergites III–V with fine and weakly defined non-setiferous punctation; tergite III with a few lateral punctures on either side and with 8–10 punctures at posterior margin; tergites IV–V each with a few lateral punctures on either side and with 12–16 punctures at posterior margin; tergite VI with a transverse band of rather dense non-setiferous punctures anteriorly and scattered setiferous punctures posteriorly; tergite VII with rather dense non-setiferous punctures in anterior half and scattered setiferous punctures in posterior half; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe; tergite VIII strongly transverse, posterior margin truncate or weakly convex, not concave in the middle (Fig. 295).

♂: sternite VIII somewhat longer than tergite VIII, its posterior margin strongly convex, in the middle truncate or nearly so (Fig. 296); median lobe of aedeagus (Figs. 274–277) 0.75–0.80 mm long; paramere with short, broad, and flattened apical lobe (Fig. 297).

Comparative notes

Zyras hongkongensis is characterized by the coloration of the body, the legs, and the antennae, by the fine punctation of the forebody, the punctation pattern of the abdomen, and by the shape of the median lobe of the aedeagus.

Distribution and natural history

Previously known only from Hong Kong (Hlaváč et al. 2011), the distribution of *Z. hongkongensis* now also includes southern China (Guangdong, Guangxi, Yunnan), Taiwan, Northeast India, Vietnam, and Indonesia (Sumatra, Java) (Fig. 306). The type material (Rougemont 2001) and at least some of the additional specimens examined were collected at light.

Zyras (Zyras) flexus **n. sp.**

(Figs. 15, 101, 156, 282–283, 302)

Type material

Holotype ♂: "China: Fujian prov., Wuyi Shan Nat. Res., Sangan [recte: Sangang] env. (900 m), 30.V.–12.VI.2001, Hlaváč & Cooter lgt. / Holotypus ♂ *Zyras flexus* sp. n. det. V. Assing 2014" (cAss).

Paratype ♀: "China: Fujian prov., Wuyi Shan Nat. Res., Masu (1100 m), 6.VI.2001, Hlaváč & Cooter lgt." (cHla).

Etymology

The specific epithet is the past participle of the Latin verb flectere and alludes to the subapically angled ventral process of the aedeagus.

Description

Moderately large species; body length 7.0–7.3 mm; length of forebody 2.9–3.3 mm. Coloration: forebody dark-brown (Fig. 101); abdomen (Fig. 156) brownish-red, with the middle of tergite VII moderately infuscate; legs weakly bicoloured: forelegs brown, mid- and hindlegs brown, with the bases of the femora yellowish and the apical portions of the tibiae and the tarsi reddish-yellow; maxillary palpi yellowish-brown to brown; antennae (Fig. 15) dark-brown, with the apical 2–5 antennomeres yellowish-brown.

Head (Fig. 101) distinctly transverse, broadly impunctate in median portion, in lateral portions with rather sparse and coarse punctation; macrosetae long and erect; interstices on average approximately as broad as diameter of punctures. Eyes longer than postocular region in dorsal view. Antenna (Fig. 15) 2.2–2.5 mm long; antennomere IV approximately as long as broad; VI weakly transverse; VI–X gradually increasing in width and increasingly transverse; X distinctly transverse, more than 1.5 times as broad as long; XI distinctly shorter than the combined length of IX and X.

Pronotum (Fig. 101) 1.11–1.13 times as broad as long and 1.27–1.29 times as broad as head; punctation dense, shallow, and relatively ill-defined; interstices on average slightly narrower than diameter of punctures; midline narrowly impunctate; antero-lateral portions with numerous very long, erect, and dense dark setae; remainder of pronotal surface with suberect pale long pubescence.

Elytra (Fig. 101) 0.87–0.89 times as long as pronotum; punctation defined and moderately dense, denser in anterior portion; interstices on average as broad as, or slightly broader than diameter of punctures. Hind wings fully developed. Metatarsomere I somewhat shorter than the combined length of II–IV.

Abdomen (Fig. 156) large, approximately as broad as elytra, with moderately deep anterior impressions on tergites III–V; posterior margins of all tergites without short setae; anterior impressions of tergites III–V with sparse

non-setiferous punctation or nearly impunctate; tergite III with a few setiferous punctures laterally and at posterior margin (absent in the middle of posterior margin in holotype), middle of disc impunctate, or nearly so; tergite IV with similar chaetotaxy as tergite III, but laterally with more extensive punctation; tergite V with punctate anterior impression and with scattered setiferous punctures and non-setiferous micropunctures on whole disc; tergite VI with coarse and rather dense oblong punctures in anterior half and sparser setiferous punctures in posterior half; tergite VII with coarse and very dense punctation in anterior portion and with moderately dense punctures in posterior portion; tergite VIII with moderately sparse punctation; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe.

♂: posterior margin of tergite VIII shallowly concave in the middle; sternite VIII somewhat longer than tergite VIII, its posterior margin strongly convex; median lobe of aedeagus relatively small in relation to body size, 0.69 mm long and shaped as in Figs. 282–283; ventral process subapically angled in lateral view.

♀: posterior margin of tergite VIII smoothly convex; posterior margin of sternite VIII weakly concave in the middle.

Comparative notes

Zyras flexus is readily distinguished from all other congeners known from China by numerous characters such as the antennal morphology, the coloration, the large abdomen, and particularly by the chaetotaxy of the pronotum, the punctation pattern of the abdomen, and the shape of the ventral process of the aedeagus. Based on similarly derived external characters (very short antennomere XI; antennae apically distinctly incrassate; pronotum with dense punctation and with numerous long black setae in antero-lateral portions; elytra and abdominal sternites with long and erect pubescence; meso- and metafemora bicoloured; abdomen with extensive punctation at least on tergites VII and VIII), *Z. flexus* is most closely allied to *Z. setosivestis* from Burma, from which it is distinguished by smaller body size, a more slender habitus, the coloration (antennomeres I–IX darker; legs paler and with only indistinctly bicoloured meso- and metafemora; abdominal segments III–VI and VIII–X reddish), more distinctly incrassate antennae (antennomere V transverse; antennomeres VI–X more strongly transverse), the more transverse pronotum, elytra with less dense punctation and shorter and less dense pubescence, and the punctation of the abdomen (punctation less dense and less extensive).

Distribution and natural history

The type specimens were collected in two geographically close localities in the Wuyi Shan, Fujian (Fig. 302), at altitudes of 900 and 1100 m.

Zyras (Zyras) formosanus **n. sp.**

(Figs. 30, 105, 166, 284–285, 305)

Zyras hirtus: Fenyes (1914); misidentification.

Type material

Holotype ♂: "Kankau (Koshun) [=Hengchun; 22°00′N, 120°44′E], Formosa, H. Sauter, VII.1909 / 4377 det. A. Fenyes / Fenyes det. / *Zyras hirtus* Kr. / DEI Müncheberg, Col-06466 / Holotypus ♂ *Zyras formosanus* sp. n., det. V. Assing 2015" (SDEI).

Paratype ♀: "Chialoshui c. 100 m, Pintung [sic] Taiwan, 3.XI.2000, Hiroshi Sugaya leg. (Under dead leaves)" (cMar).

Etymology

The specific epithet is an adjective derived from Formosa, the ancient name of Taiwan.

Comment

The holotype is one of the two specimens erroneously reported as *Z. hirtus* from Taiwan by Fenyes (1914).

Description

Body length 5.3–6.2 mm; length of forebody 2.2–2.6 mm. Coloration: head dark-reddish; pronotum and elytra reddish (Fig. 105); abdomen (Fig. 166) reddish, with segment VI, the posterior portion of segment V, and the anterior portion of segment VII slightly darker; legs dark-yellowish, with the apices of the metafemora indistinctly darker; antennae (Fig. 30) reddish-brown to dark-brown, with antennomeres I–II reddish and the apical 2–4 antennomeres reddish to pale-reddish (gradually becoming paler towards apex of antenna); maxillary palpi reddish-yellow.

Head (Fig. 105) distinctly transverse, broadly impunctate in median portion, in lateral portions with scattered fine punctation. Eyes large and strongly bulging, much longer than postocular region in dorsal view. Antenna (Fig. 30) slender, 2.1–2.2 mm long; antennomeres IV distinctly, V–VI decreasingly oblong; VI very weakly oblong, VII approximately as long as broad; VIII–X weakly transverse; XI slightly shorter than the combined length of IX and X.

Pronotum (Fig. 105) approximately 1.15 times as broad as long and 1.2 times as broad as head; punctation fine, sparse, and very shallow; interstices much broader than diameter of punctures; midline broadly impunctate; pubescence fine, sparse, and moderately long.

Elytra (Fig. 105) short, approximately 0.65 times as long as pronotum; punctation moderately coarse and moderately dense. Hind wings not examined, probably reduced. Metatarsomere I slightly shorter than the combined length of II–IV.

Abdomen (Fig. 166) large, broader than elytra, with rather deep anterior impressions on tergites III–V; tergites

III–V without distinct non-setiferous punctures in anterior impressions and with a lateral setiferous puncture on either side; tergite III with a row of 8, tergites IV–V each with a row of 10–12 punctures bearing long black setae at posterior margin; tergite VI with a transverse row of non-setiferous punctures at anterior margin, with a pair of lateral setiferous punctures on either side, and with a transverse row of 15–20 setiferous punctures near posterior margin; tergite VII with rather sparse non-setiferous punctures in antero-median portion and with numerous setiferous punctures partly arranged in transverse rows in posterior third; tergite VIII with punctures bearing long black setae in posterior fourth or third; sternites with long, dense, and erect dark setae in posterior halves; integument without microsculpture and glossy; posterior margin of tergite VII without palisade fringe; tergite VIII distinctly transverse, its posterior margin truncate or weakly concave in the middle.

♂: sternite VIII transverse and longer than tergite VIII, its posterior margin nearly truncate in the middle; median lobe of aedeagus (Figs. 284–285) 0.75 mm long and with rather stout ventral process in lateral view; apical lobe of paramere rather short and stout.

♀: posterior margin of sternite VIII weakly concave in the middle.

Comparative notes

This species is characterized particularly by its broad abdomen (in relation to forebody), the nearly uniformly reddish coloration of the body, the absence of a palisade fringe at the posterior margin of the abdominal tergite VII, the rather long and relatively massive antennae, the punctation pattern of the abdomen, and the shape of the median lobe of the aedeagus. It is distinguished from *Z. hirtus*, with which it was previously confounded, by the smaller and less robust body, the morphology of the antennae (*Z. hirtus*: antennomeres IV–X distinctly transverse), the much coarser punctation of the elytra, the much sparser punctation of the abdomen, the shorter elytra, the absence of a palisade fringe at the posterior margin of tergite VII, and by the smaller aedeagus with a much stouter ventral process.

Distribution and natural history

The type specimens were collected in two localities in Pingtung Hsien in the south of Taiwan (Fig. 305). The paratype was sifted from leaf litter at an altitude of approximately 100 m.

Zyras (Zyras) glabricollis Scheerpeltz, 1965
(Figs. 11, 106, 162, 171, 286–288, 306)

Zyras (Zyras) glabricollis Scheerpeltz, 1965: 358 f.

Type material examined

Holotype ♂: "N. E. Burma, Kambaiti 7000 ft., 7–9.VI.1934, R. Malaise / Holotypus / Typus *Zyras glabricollis* O. Scheerpeltz / *Zyras (Zyras) glabricollis* n. sp., det. Scheerpeltz 1941 / 3748, E91 + / NHRS-JLKB 000023266 / *Zyras glabricollis* Scheerpeltz, det. V. Assing 2015" (SMNH).

Comment

The original description is based on a single male holotype from "N. E. Burma, Kambaiti" (Scheerpeltz 1965).

Redescription

Body length 5.7 mm; length of forebody 2.6 mm. Coloration: head blackish-brown (Fig. 171); pronotum reddish-brown (Fig. 162); elytra yellowish with the postero-lateral portions extensively infuscate (Fig. 106); abdomen (Fig. 162) pale reddish-brown, with segment VI dark-brown, and the posterior margins of the segments yellowish; legs and maxillary palpi yellowish; antennae (Fig. 11) pale-brown, with the basal two antennomeres pale-reddish.

Head (Fig. 171) distinctly transverse, broadly impunctate along middle; punctation in lateral dorsal portions fine and sparse, bearing long pale setae. Eyes noticeably longer than postocular region in dorsal view. Antenna (Fig. 11) long and slender 2.5 mm long; antennomeres IV–VII distinctly oblong; VIII weakly oblong; IX–X as broad as long or weakly transverse; XI nearly as long as the combined length of IX and X.

Pronotum (Fig. 171) relatively weakly transverse, 1.1 times as broad as long and 1.24 times as broad as head, posteriorly with a pronounced median impression; punctation confined to a pair of median punctures anteriorly, a transverse cluster of punctures on either side behind the middle, and few lateral and marginal punctures, disc largely impunctate.

Elytra (Fig. 106) 0.9 times as long as pronotum; punctation moderately coarse and dense in lateral and anterior portions, sparser in postero-sutural portions. Hind wings fully developed. Metatarsomere I shorter than the combined length of II–IV.

Abdomen (Fig. 162) wedge-shaped, distinctly tapering posteriad and with rather shallow anterior impressions on tergites III–V; anterior impressions of tergites III–V and anterior portions of tergites VI–VII with smooth grooves, but without punctation; tergites III–VI with a lateral puncture on either side and a transverse row of setiferous punctures near hind margin, otherwise impunctate; tergite VII with two irregular transverse rows of punctures in posterior portion; tergite VIII with approximately 20 punctures bearing long black setae in posterior portion; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe.

♂: tergite VIII weakly transverse, middle of posterior margin with a sharply delimited concavity; sternite VIII (Fig. 288) longer than tergite VIII, weakly transverse,

posteriorly conspicuously truncate, middle of posterior margin weakly concave; median lobe of aedeagus (Figs. 286–287) 0.65 mm long; ventral process strongly curved and with long and very acute apex in lateral view; paramere with conspicuously long apical lobe.

♀: unknown.

Comparative notes

Zyras glabricollis is distinguished from other species of the genus, except *Z. extensus* and *Z. rectus*, by the combination of slender habitus, long and slender antennae, a characteristic punctation pattern of the pronotum and the abdomen, the wedge-shaped abdomen, a posteriorly conspicuously truncate male sternite VIII, and an apically remarkably acute ventral process of the aedeagus. For characters separating it from the similar and evidently closely related *Z. extensus* see the comparative notes in the following section.

Distribution and natural history

This species is currently known only from the type locality, which is situated in northeastern Burma, close to the border with Yunnan (Fig. 306), at an altitude of approximately 2100 m.

Zyras (Zyras) extensus **n. sp.**

(Figs. 12, 107, 163, 289–290, 306)

Type material

Holotype ♂: "China: Yunnan, Lincang Pref., Laobie Shan, Wei Bo Shan pass, 24°08′16″N, 99°42′53″E, 2375 m, creek valley, devastated second. decid. forest, litter & moss sifted, 8.IX.2009, leg. M. Schülke [CH09-35] / Holotypus ♂ *Zyras extensus* sp. n. det. V. Assing 2014" (cAss).

Paratypes: 2♂♂: same data as holotype (cSch, cAss); 1 ♀ [teneral]: "China: Yunnan, Lincang Pref., Xue Shan, 11 km ENE Lincang, 2510 m, 23°55′01″N, 100°11′17.5″E, second. pine forest with Rhodod., small cleft with water, litter & mushrooms sifted, 10.IX.2009, leg. M. Schülke [CH09-39]" (cSch); 1 ♂, 1 ♀: "China: Yunnan province, Shanzhi env., 22.–24.VI.2007, Jizu Shan Mt., 2180–2580 m, along the path to the summit, 27°57.7–8′N, 100°22.1–23.6′E, J. Hájek & J. Růžička leg. / sifted detritus and leaves, dense mixed forest (with dominant *Pinus*, *Quercus* and *Rhododendron*) near stream [CH45-47]" (cSch); 1 ♂, 1 ex.: "China (N-Yunnan) Lijiang Naxi Aut. Co., E Yulongxue Shan, 30 km N Lijiang, 2800–2900 m, 27°09.0′N, 100°14.9′E (creek valley, secondary mixed forest), 13.VIII.2003 Wrase [01]" (cSch, cAss); 1 ex.: same data, but leg. Schülke (cSch).

Etymology

The specific epithet is the past participle of the Latin verb extendere (to stretch) and alludes to the conspicuously long and slender antennae.

Description

Body length 5.0–6.8 mm; length of forebody 2.4–2.8 mm. Coloration: head and pronotum blackish-brown to blackish; elytra dark-brown to blackish-brown with the humeral angles and the sutural portion more or less distinctly and more or less extensively yellowish to reddish (Fig. 107); abdomen (Fig. 163) reddish, with the middle of tergite V more or less extensively, and tergites VI–VIII (except posterior margin), more or less strongly infuscate; legs and maxillary palpi yellowish; antennae (Fig. 12) dark-brown, with antennomeres I–II and XI reddish.

Head (Fig. 107) moderately transverse, nearly impunctate, only with some fine setiferous punctures bearing long fine pale setae in lateral portion; interstices much broader than diameter of punctures. Eyes longer than postocular region in dorsal view. Antenna (Fig. 12) conspicuously slender, 2.4–2.7 mm long; antennomeres IV–X oblong; XI slender, as long as the combined length of IX and X, or slightly shorter.

Pronotum (Fig. 107) 1.10–1.15 times as broad as long and 1.3–1.4 times as broad as head; punctation distinctive: near the anterior margin and slightly behind middle with a median pair of coarse punctures, with some setiferous punctures in medio-lateral portion, antero-lateral and postero-lateral portions extensively impunctate; anterior and lateral margins with some very long black setae.

Elytra (Fig. 107) approximately 0.9 times as long as pronotum, somewhat convex in cross-section; punctation fine and very sparse, in posterior portion partly absent; interstices several times as broad as diameter of punctures. Hind wings fully developed. Metatarsomere I slightly shorter than the combined length of II–IV.

Abdomen (Fig. 163) wedge-shaped, distinctly tapering posteriad and with rather deep anterior impressions on tergites III–V; anterior impressions of tergites III–V and anterior portion of tergite VI each with a row of sparse and rather coarse non-setiferous punctures; tergites III–VI impunctate, except for a transverse row of setiferous punctures bearing long black setae near posterior margins and with few setiferous punctures in lateral portions; tergite VII with two rows of setiferous punctures bearing thin pale setae in posterior half and with few scattered punctures in anterior portion; tergite VIII with moderately dense setiferous punctures only in posterior portion; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe; tergite VIII without evident sexual dimorphism, with shallow concavity in the middle of hind margin.

♂: sternite VIII longer than tergite VIII, posterior margin conspicuously truncate, in the middle even concave; median lobe of aedeagus approximately 0.8 mm long; ventral process strongly curved and with conspicuously acute apical portion in lateral view (Figs. 289–290); apical lobe of paramere conspicuously long and thin, more than half as long as basal portion.

♀: sternite VIII similar to that of male, but posterior margin with less pronounced postero-lateral angles.

Comparative notes

This highly distinctive species differs from other *Zyras* species known from China, except *Z. glabricollis* and *Z. rectus* (see preceding and following sections), by numerous characters, particularly the conspicuously long and slender antennae, the conspicuously sparse punctation of the forebody, the punctation pattern of the abdomen, by the morphology of the median lobe of the aedeagus, and by the conspicuously long apical lobes of the parameres. The synapomorphically modified morphology of the parameres in particular suggests that *Z. extensus*, *Z. glabricollis*, and *Z. rectus* represent a distinct lineage. The similarly modified male sternite VIII suggests that *Z. extensus* is most closely related to *Z. glabricollis*, from which it is distinguished by the darker coloration, particularly of the antennae, the pronotum, and abdominal tergite VI, by the slightly less slender antennae, the near absence of punctures even in the lateral portions of the head, the sparser punctation of the elytra, the more numerous marginal punctures on the abdominal tergites III–V, the presence of a transverse row of punctures on tergite VI, the more numerous punctures on tergite VII, and by the larger aedeagus with a more pronounced crista apicalis and a longer, less strongly curved (lateral view), and more slender (ventral view) ventral process. For characters distinguishing *Z. extensus* from *Z. rectus* see the comparative notes in the following section. The distinguishing characters observed are not very pronounced, but, based on the examined material, apparently constant. Nevertheless, the possibility that they may be an expression of intra- rather than interspecific variation cannot be ruled out with certainty. Additional males of *Z. glabricollis* from the vicinity of the type locality of that species would be required to confirm the present hypothesis that *Z. glabricollis* and *Z. extensus* represent different species.

Distribution and natural history

The specimens were collected in several localities in Yunnan (Fig. 306), by sifting leaf litter in mixed, coniferous, and deciduous forests at altitudes between 2180 and 2900 m. One female collected in September is teneral.

Zyras (Zyras) rectus **n. sp.**
(Figs. 13, 108, 164, 291–292, 306)

Type material

Holotype ♂: "China: Yunnan [CH07-11], Baoshan Pref., Gaoligong Shan, nr. Xiaoheishan N. R., 35 km SE Tengchong, 2110 m, 24°50′16″N, 98°45′43″E, decid. forest, litter, sifted, 30.V.2007, M. Schülke / Holotypus ♂ *Zyras rectus* sp. n. det. V. Assing 2014" (cAss).

Paratypes: 1 ♀: same data as holotype (cSch); 1 ♀: "China: Yunnan, Baoshan Pref., Gaoligong Shan, W pass 35 km SE Tengchong, 2100 m, 24°50′18″N, 98°45′43″E, devast. prim. dec. forest, litter, wood, mushrooms sifted, 25.VIII.2009, leg. M. Schülke [CH09-06]" (cSch).

Etymology

The specific epithet (Latin, adjective) alludes to the nearly straight ventral process of the aedeagus (lateral view), one of the characters distinguishing this species from the similar *Z. extensus*.

Description

Body length 5.1–6.3 mm; length of forebody 2.5–2.8 mm. Coloration: head and pronotum blackish-brown to blackish; elytra dark-brown to blackish-brown with the humeral angles and the sutural portion yellowish (Fig. 108); abdomen (Fig. 164) with segments III–IV reddish and tergites V–VIII, except the narrowly reddish posterior margins, dark-brown to blackish; legs and maxillary palpi yellowish; antennae (Fig. 13) dark-brown, with antennomeres I–II yellowish-red and XI dark-reddish.

Antenna (Fig. 13) slender, 2.3–2.5 mm long; antennomeres IV–VII oblong; VIII–IX approximately as broad as long; X weakly transverse; XI slender, as long as the combined length of IX and X, or slightly shorter. Tergite VIII with posterior margin truncate, not distinctly concave in the middle.

Other external characters as in *Z. extensus*.

♂: sternite VIII longer than tergite VIII, posterior margin truncate to weakly convex; median lobe of aedeagus approximately 0.8 mm long; ventral process slender, weakly curved, and with conspicuously acute apical portion in lateral view (Figs. 291–292); apical lobe of the paramere conspicuously long and thin, more than half as long as basal portion.

♀: sternite VIII posteriorly weakly convex.

Comparative notes

Based on the similar external characters and particularly the similarly derived morphology of the median lobe (ventral process very slender in ventral view; apex of ventral process conspicuously acute in lateral view) and the paramere (apical lobe conspicuously long and thin), *Z. rectus* in undoubtedly closely allied to *Z. glabricollis* and *Z. extensus*, from which it differs by the antennal morphology (less massive; antennomeres IV–VII less oblong, VIII–IX as broad as long, and X weakly transverse), by the shape of the male sternite VIII, and by the shape of the ventral process of the aedeagus (longer in relation to basal portion of median lobe; more slender in ventral view; less distinctly curved in lateral view; crista apicalis distinctly narrower).

Distribution and natural history

The species is known from two geographically close localities to the southeast of Tengchong in the Gaoligong

Shan (Fig. 306). The specimens were sifted from leaf litter in deciduous forests at an altitude of approximately 2100 m.

Zyras (Zyras) gibbus Pace, 2010

Zyras (Zyras) gibbus Pace, 2010a: 26.

Type material examined

Holotype ♂: "Taiw. Kaohsiung Hs., for. abv. Tona For. Sta., 1100 m, 30.IV.1998, A. Smetana [T192] / Holotypus *Zyras gibbus* mihi, det. R. Pace 2006 / *Zyras gibbus* n. sp., det. R. Pace 2006" (MCSNV).

Comment

The original description is based on a unique male from "Taiwan, Kaohsiung Hs., For. abv. Tona Sta." (Pace 2010a). A loan of this specimen was requested prior to the finalization of the manuscript, but this request remained unanswered. Eventually, thanks to the efforts of Adriano Zanetti (Verona), however, it was possible to examine the holotype after submission of the manuscript.

Redescription

Body length 6.1 mm; length of forebody 2.5 mm. Coloration: body blackish-brown; legs dark-yellowish (probably an artefact resulting from the procedure used during the dissection; originally probably pale-yellowish); antennae blackish-brown with the apical portion of antennomere XI slightly paler.

Head strongly transverse and distinctly wedge-shaped, broadest posteriorly; punctation of dorsal surface moderately coarse and moderately dense; antero-median portion extensively, postero-median portion narrowly impunctate. Eyes large, nearly reaching posterior margin of head in dorsal view. Antenna 2.1 mm long and slender; antennomeres IV–V weakly oblong, VI approximately as long as broad, VII–X gradually, very weakly increasing in width and increasingly transverse, X much less than 1.5 times as broad as long and only slightly broader than IV, and XI slightly longer than combined length of IX and X.

Pronotum strongly transverse, 1.28 times as broad as long and 1.33 times as broad as head; posterior margin rather strongly convex; posteriorly with a large and pronounced transverse elevation; anteriorly, near middle, with an impression on either side of middle; punctation conspicuous: very dense and strongly granulose along middle and on posterior elevation, less dense and less strongly granulose in lateral portions; lateral margins each with five long and stout erect setae, anterior margin with two such setae on either side.

Elytra 0.82 times as long as pronotum; punctation rather dense, equally distributed, and slightly granulose. Hind wings present. Metatarsomere I approximately as long as combined length of II–IV.

Abdomen wedge-shaped, broadest at segment IV, and approximately as broad as elytra; tergite III posteriorly with a pronounced, dorso-ventrally flattened, broad, and medially pointed median projection (male secondary sexual character?); tergites III–IV with shallow, tergite V without anterior impression; anterior portions of tergites III–VII without non-setiferous punctation, only with micropunctation; tergites III–V posteriorly with moderately dense setiferous punctation; tergite VI with fine and sparse punctation; tergite VII with dense and coarse granules in the middle (male secondary sexual character?); tergite VIII with coarse and dense oblong granules, its posterior margin truncate.

♂: median lobe of aedeagus 0.63 mm long; ventral process rather long, slender, and parallel-sided; crista apicalis pronounced. For illustrations see Pace (2010a).

Comparative notes

This species is unique among Chinese *Zyras* sensu strictu particularly in the shape of the head, the large eyes, as well as regarding the modifications of the pronotum and the abdomen. Based on the similar habitus, particularly on the similarly derived head shape, it is closely allied to *Z. trapeziceps* Dvořák, 1996 (Vietnam) and related species, which are associated with ants of the genus *Leptogenys* Roger, 1861. For an illustration of the forebody of *Z. trapeziceps* see Assing (2015d).

Distribution and natural history

The type locality is situated in Taiwan at an altitude of 1100 m. The phylogenetic affiliations (see above) suggest that *Z. gibbus* is myrmecophilous, too.

3.6 Species of doubtful identity

Zyras (Zyras) hauserianus Bernhauer, 1933 (Figs. 38, 77, 132)

Zyras (Zyras) hauserianus Bernhauer, 1933a: 46.

Type material examined

Holotype ♀: "Thian-S., Tekesthal / 527 / *Hauserianus* Bernh. (*Zyras*), Typus unic. / *Hauserianus* Brnh. Typ. unic., don. D. G. Hauser. / Chicago NHMus, M. Bernhauer Collection / Holotypus ♀ *Zyras* (s. str.) *hauserianus* Brnh., P. Hlaváč det. 2003 / *Zyras hauserianus* Bernhauer, det. V. Assing 2015" (FMNH).

Comment

The original description is based on a unique female from "Thian-S.: Tekestal" (Bernhauer 1933a). The valley of the Tekes river is situated in the Tian Shan and extends

from southeastern Kazakhstan to northwestern China (eastern Xinjiang province) [approximately 42°55′N, 81°22′E].

In external characters [size and habitus; shape and punctation of pronotum (Fig. 77); shape of antennae (Fig. 38); general punctation pattern of the abdomen (Fig. 132)], the holotype is similar to the present interpretation of *Z. inexcisus*, but distinguished by the sparser punctation of the elytra, the denser, more extensive, and coarser non-setiferous punctation of the anterior impressions of tergites III–V and of the anterior portions of tergites VI–VII, the paler coloration of the antennae and of the margins of the abdominal tergites (anterior margins of tergites VI and VII distinctly and broadly pale-reddish). These differences are not pronounced, but sufficient to cast considerable doubt on the hypothesis that both names should refer to the same species. However, more material, particularly males, from the vicinity of the type locality would be needed to confirm that *Z. hauserianus* and *Z. inexcisus* represent distinct species. For characters distinguishing *Z. hauserianus* from the similar *Z. illecebrosus* see the section on that species.

Zyras (Zyras) songanus Pace, 1993
(Figs. 54, 111, 139)

Zyras (Zyras) songanus Pace, 1993: 114.

Type material examined

Holotype ♀: "China, Beijing, VIII.1982, Rougemont / Holotypus *Zyras songanus* m., det. R. Pace 1987 / *Zyras songanus* sp. n., det. R. Pace 1987 / *Zyras songanus* Pace, det. V. Assing 2015" (cRou).

Additional material examined

China: 2 ♀♀ [1 teneral], Beijing, Yan Shan, Dongling Mountains, Xiaolongmen, 1400 m, 15.–16.VI.2001, leg. Hlaváč & Cooter (cHla, cAss); 1 ♀, Beijing, Xiaolongmen, 39°58′N, 115°26′E, 1100 m, 9.–13.VI.2004, leg. Cooter (cAss).

Comment

According to the original description, which is based on a unique female from "Beijing" and which specifies practically nothing except the coloration, the holotype is deposited in the Chinese Academy of Sciences, Beijing (Pace 1993). The specimen, however, was located in cRou.

Redescription

Body length 5.6–6.3 mm; length of forebody 2.2–2.6 mm. Coloration: head and pronotum blackish-brown to blackish; elytra yellowish, with the postero-lateral angles moderately extensively infuscate (Fig. 111); abdomen (Fig. 139) of somewhat variable coloration: dark-brown with the margins of tergites V–VIII yellowish, tergites III–IV completely yellowish (holotype) or with infuscate antero-median portion, or of similar coloration as posterior tergites; legs pale-yellowish to dark-yellowish; antennae (Fig. 43) pale-reddish to dark-brown, with the basal 2–3 antennomeres paler yellowish to reddish and antennomere XI pale-reddish to dark-reddish; maxillary palpi yellowish to reddish-yellow.

Head (Fig. 111) distinctly transverse, broadly impunctate in median portion, in lateral portions with moderately sparse and and moderately coarse punctation; interstices on average approximately as broad as, or broader than diameter of punctures. Eyes slightly longer than postocular region in dorsal view. Antenna (Fig. 43) 1.6–1.7 mm long; antennomere IV weakly transverse, antennomeres V–X of gradually increasing width and increasingly transverse, X approximately 1.5 times as broad as long; XI slightly longer than the combined length of IX and X.

Pronotum (Fig. 111) 1.11–1.18 times as broad as long and 1.25–1.37 times as broad as head; punctation dense and defined; midline narrowly impunctate.

Elytra (Fig. 111) 0.82–0.86 times as long as pronotum; punctation defined and rather dense, denser in anterior portion. Hind wings fully developed. Metatarsomere I somewhat shorter than the combined length of II–IV.

Abdomen (Fig. 139) approximately as broad as, or somewhat narrower than elytra, with moderately deep anterior impressions on tergites III–V; anterior impressions of tergites III–V and anterior portions of tergites VI–VII with dense (but not extensive) non-setiferous punctation; remainder of tergal surfaces with dense setiferous punctation; tergite VIII with dense punctation, except for a narrow transverse band near anterior margin; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe.

♂: unknown.

♀: posterior margin of tergite VIII smoothly convex or truncate in the middle; posterior margin of sternite VIII smoothly convex or indistinctly concave in the middle.

Comparative notes

Among the species of the *Z. shaanxiensis* coloration pattern, this species is characterized particularly by the relatively short and distinctly incrassate antennae and the extensive and rather dense setiferous punctation of the abdomen.

Distribution and natural history

Reliable and confirmed records are currently known only from Beijing province. All other specimens identified by R. Pace as *Z. songanus* were misidentified. The additional material was collected at altitudes of 1100–1400 m. One of non-type specimens is slightly teneral (June).

3.7 Doubtful records

Zyras (Zyras) particornis (Sharp, 1888)

Myrmedonia particornis Sharp, 1888: 290.

Comment

This species was originally described from Japan and subsequently recorded also from the Russian Far East, and Korea (Hlaváč et al. 2011). Li (1992) reported it from the Chinese province Jilin, but the records in this book are notoriously unreliable; moreover, previous attempts at recovering reference specimens (see, e. g., Feldmann et al. 2014) have been unsuccessful. This species is characterized by the coloration alone: head and elytra black; pronotum bright-reddish; abdomen with segments III–V reddish, segment VI reddish with the middle of tergite VI extensively blackish, tergite VII black with the anterior margin and the antero-lateral portions reddish, and tergite VIII black; legs yellow; antennae distinctly bicoloured, with antennomeres I–VIII blackish and IX–XI pale-yellowish. For an image of this species see http://www.zin.ru/Animalia/Coleoptera/images/sources/Zyras_particornis_ms.jpg.

Zyras (Zyras) condignus Last, 1969

Zyras (Zyras) distinctus Cameron, 1939b: 540; preoccupied.
Zyras (Zyras) condignus Last, 1969: 279; replacement name.

Comment

This species was originally described from North India and subsequently reported from Nepal and Vietnam (Cameron 1939b, Hlaváč et al. 2011). Pace (2010a) doubtfully recorded it also from Taiwan.

Zyras (Zyras) cylindricornis Dvořák, 1981

Zyras (Zyras) cylindricornis Dvořák, 1981: 56.

Comment

According to the original description, which is based on a unique male from "Japan, Honschu, Halbinsel Hinomi (p. Hiroschima)", *Z. cylindricornis* is characterized as follows: body length 7.0 mm; head and pronotum black, elytra reddish-brown with infuscate postero-lateral angles, abdomen black with the paratergites and the posterior margins of the tergites brown, legs and palpi brownish-yellow; antennae cylindriform; pronotum densely and regularly punctate, except for the median impunctate band (Dvořák 1981). The species was subsequently recorded also from Korea and China (Liaoning) (Hlaváč et al. 2011). These records require revision.

Zyras (Zyras) hirtus (Kraatz, 1859)

Myrmedonia hirta Kraatz, 1859: 25.

Type material examined

Holotype ♀: "Ceylon, J. Nietner / Holotypus / *hirta* mihi / coll. Kraatz / *Myrmedonia hirta* Kraatz / DEI Müncheberg, Col-06465" (SDEI).

Additional material examined

India: 5 exs., Tamil Nadu, Nilgiri Hills, 15 km SE Kotagiri, Kunchappanai, 11°22′N, 76°56′E, 900 m, 15.XI.1993, leg. Boukal & Kejval (NHMW, cAss).

Sri Lanka: 2 exs., Uva, S Wellawaya, 300 m, 25.I.1970, leg. Mussard, Besuchet & Löbl (MHNG, cAss); 3 exs., North central, Ambagaswewa, 3.II.1970, leg. Mussard, Besuchet & Löbl (MHNG); 1 ex., Central, S Mululla, 750 m, 4.II.1970, leg. Mussard, Besuchet & Löbl (cAss).

Comment

The original description of *Zyras hirtus* is based on a "Specimen unicum in insula Ceylan lectum" (Kraatz 1859). The holotype, a female, is deposited in SDEI. The subsequent record from Taiwan by Fenyes (1914) (see also Shibata 1973) is erroneous (see section on *Z. formosanus*).

3.8 Unnamed species

The examined material included a considerable number of specimens that could not be attributed to any of the described species. Most, if not all, of these specimens are likely to represent undescribed species, but remain unnamed as they are either females or teneral males. The material is deposited in cAss unless indicated otherwise.

Zyras (Zyras) sp. 1

Material examined: China: 1 ♀, Jiangxi, Jinggang Shan, Jingzhu Shan, 26°31′N, 114°06′E, 640 m, 25.IV.2010, leg. Fikáček et al. (NMP).

This species is characterized as follows: body length 8.0 mm; length of forebody 3.3 mm; head and pronotum black; elytra reddish-yellow with the postero-lateral portions extensively black; abdomen with segments III–VI bright-reddish, tergite VII black with the anterior portion bright-reddish, and tergite VIII black; legs yellow; antennae blackish with antennomere XI pale-brown; maxillary palpi dark-brown with palpomere IV yellowish; abdominal tergites V–VI with non-setiferous punctures also in median portion; tergite VII with non-setiferous punctures in nearly all of anterior half and with numerous punctures in posterior half.

Zyras (Zyras) sp. 2

Material examined: Taiwan: 2 ♀♀, NE-Taiwan, Ilan Hsien, "75 km, N.Crossing Highway", 1100 m, flight interception trap, 22.V.2003, leg. Li (MNHUB).

This species is of similar size and coloration as *Z. nigronitens*, but differs by the longer and more massive antennae, denser and more regular punctation of the elytra (also near posterior margin), as well as much denser non-setiferous punctation and more extensive setiferous punctation on the abdomen.

Zyras (Zyras) sp. 3

Material examined: Taiwan: 1 ♀, Ilan Hsien, "17 km, 100 Logging Road", 1650 m, flight interception trap, 22.VII.2003, leg. Li (MNHUB).

Using the key in section 3.4, this species would key out at couplet 9 together with *Z. beijingensis*, from which it differs by numerous characters such as bicoloured elytra, a much more extensively reddish abdomen, distinctly longer and more slender antennae, smaller eyes, a less transverse pronotum, more sparsely and coarsely punctate elytra, and a different punctation pattern of the abdomen.

Zyras (Zyras) sp. 4

Material examined: China: 1 ♂ [teneral], Sichuan, Aba Tibet. Aut. Pref., Weizhou Co., Qionglai Shan, Wolong valley, 20 km WNW Dujiangyan, 31°05′N, 103°26′E, 1100 m, stream bank, 14.VII.1999, leg. Wrase.

Except for the paler antennae with a pale-yellowish antennomere XI, the coloration pattern of this species is similar to that of *Zyras* sp. 1. It is additionally characterized by relatively small body size (body length 6.1 mm; length of forebody 2.8 mm), a weakly transverse pronotum with coarse, rather sparse, and irregularly spaced punctation and with a pair of two oblong elevations in posterior portion, and by an abdomen with coarse non-setiferous punctation in the anterior portions and very sparse punctation in the posterior portions of tergites III–VII.

Zyras (Zyras) sp. 5

Material examined: China: 1 ♀, Sichuan, Ya'an Pref., Tianquan Co., 57 km W Ya'an, Jiajin Shan, valley above Labahe N. R. St., 30°06′N, 102°25′E, 1800 m, forest, 12.VII.1999, leg. Wrase.

This species is distinguished from the highly similar *Z. setosivestis* only by the distinctly denser punctation of the abdomen.

Zyras (Zyras) sp. 6

Material examined: China: 1 ♀, Yunnan, Lijiang Naxi Aut. Co., 53 km WSW Lijiang, 3 km NW Yongsheng, 26°42′N, 100°43′E, 1950–2000 m, secondary broad-leaved forest, 14.VIII.2003, leg. Schülke.

This species is similar to *Zyras* sp. 5, but distinguished by smaller body size (body length 6.4 mm; length of forebody 3.0 mm), by the reddish-yellow abdominal segments VIII and posterior portion of segment VII, and by shorter antennae with a transverse antennomere V and more transverse antennomeres VI–X. In size, coloration, chaetotaxy, and habitus, the specimen much resembles *Z. funestus* (Dvořák, 1996) from Vietnam (male unknown), but differs by distinctly finer and shallower punctation of the pronotum and the elytra, longer and less strongly incrassate antennae with less transverse antennomeres V–X, as well as by the reddish-yellow abdominal segment VIII (*Z. funestus*: segment VIII reddish-brown to dark-brown).

Zyras (Zyras) sp. 7

Material examined: China: 1 ♀, Sichuan, Qingcheng Shan, NW Chengdu, 30°54′N, 103°33′E, 650–700 m, 3.–4.VI.1997, leg. Wrase.

Based on the similar external characters (habitus, short antennomere XI, etc.), this species, too, is closely related to *Z. setosivestis* and allied species (*Z.* sp. 5 and *Z.* sp. 6). In size (body length 6.9 mm; length of forebody 2.9 mm) and habitus, it is most similar to *Zyras* sp. 6, from which it differs by blackish-brown abdominal segments VII–VIII (posterior margin of tergites VIII slightly paler), dark-reddish anterior margins of segments III–VI, uniformly yellowish legs, the coloration of the antennae (antennomeres I–IV blackish brown, V–XI gradually becoming paler, XI yellowish-brown), and by the impunctate anterior half of tergite VIII (punctate in *Z.* sp. 6).

Zyras (Zyras) sp. 8

Material examined: China: 1 ♀, Yunnan, Baoshan Pref., Gaoligong Shan, 65 km NNE Tengchong, 25°35′N, 98°40′E, 1750 m, secondary mixed forest, litter and moss sifted, 31.VIII.2009, leg. Schülke; 1 ♀, Yunnan, Baoshan Pref., Gaoligong Shan, 32 km SE Tengchong, 24°51′N, 98°44′E, 1600 m, degraded primary forest, 28.VIII.2009, leg. Schülke; 1 ♀, Yunnan, Baoshan Pref., mountain range 25 km S Tengchong, 24°48′N, 98°32′E, 1900 m, degraded primary deciduous forest, litter sifted, 2.VI.2007, leg. Wrase.

This species is most similar to *Z. rectus*, from which it differs by the even finer antennae with oblong antennomeres IX and by the completely blackish body (except for the narrow posterior margins of the abdominal segments).

Zyras (Zyras) sp. 9

Material examined: Taiwan: 1 ♀, Taichung Hsien, Anmashan, 2230 m, 12.V.1982, leg. Smetana [T127] (cSme).

This species is characterized by rather large size (body length 8.0 mm; length of forebody 3.3 mm) and its coloration: head and pronotum black; elytra pale-reddish with the postero-lateral portions infuscate (infuscate portion rather ill-defined); abdomen with segments III–VI black with indistinctly paler posterior margins and with segments VII–VIII reddish; legs and maxillary palpi yellowish; antennae dark-brown with antennomeres I–III and XI

reddish. It differs from the similarly coloured *Z. rufoterminalis* particularly by distinctly smaller body size, much shorter antennae, shorter elytra with coarser and less dense punctation, and dense non-setiferous punctation of the anterior portions of abdominal tergites III–VII.

Zyras (Zyras) sp. 10

Material examined: China: 1 ♀, Yunnan, Baoshan Pref., mountain range 22 km S Tengchong, 24°49′N, 98°29′E, 1750 m, secondary forest, litter sifted, 2.VI.2007, leg. Schülke.

The similar habitus, size, and punctation suggests that this species is closely allied to *Z. bisinuatus*, from which it is distinguished by the coloration (whole body black except for the dark-reddish anterior margins, antero-lateral portions, and anterior portions of paratergites of the abdominal tergites III–VII; legs yellowish with the profemora dark-brown and the apical halves of the meso- and metafemora blackish; antennae dark-brown with antennomere XI yellowish), the much sparser punctation of the pronotum, and the smoothly convex posterior margin of tergite VIII.

Zyras (Zyras) sp. 11

Material examined: China: 1 ♀, Yunnan, Dali Bai Aut. Pref., mountain range N Er Hai, 42 km N Dali, 26°05′N, 100°10′E, 2500–2550 m, NE-slope with oak, litter sifted, 12.VI.2007, leg. Schülke.

This distinctive species is characterized by small body size (body length 4.8 mm; length of forebody 2.2 mm), a slender habitus with a weakly transverse and sparsely punctate pronotum, strongly incrassate antennae (antennomere IV approximately twice as broad as long; antennomeres V–IX increasingly transverse and of gradually increasing width; X slightly narrower than IX; IX and X nearly three times as broad as long; XI of conical shape and rather short), and by the coloration (body black; legs pale-yellowish; antennae blackish with antennomeres I–III and apical half of XI reddish-brown).

Zyras (Zyras) sp. 12

Material examined: China: 2 ♀♀, Sichuan, Daxue Shan, 25 km SE Kangding, 3200–3500 m, 13.VI.–4.VII.2009, leg. Plutenko; 1 ♀, Sichuan, Gongga Shan, Hailuogou, above camp 3, 29°35′N, 102°00′E, 3200 m, 7.VII.1996, leg. Smetana et al. (cSme) [labelled: "*Zyras wei* Pace, det. R. Pace 1999"] (cSme); 1 ♀, Sichuan, Gongga Shan, Hailuogou, above camp 3, 29°35′N, 102°00′E, 3050 m, 6.VII.1996, leg. Smetana et al. (cSme) [labelled: "*Zyras wei* Pace, det. R. Pace 1999"] (cSme).

This species is characterized by relatively small body size (body length 5.1–6.0 mm; length of forebody 2.5–3.0 mm), a somewhat depressed forebody (pronotum weakly convex in cross-section), dense and moderately coarse punctation of the forebody, the punctation of the abdomen (anterior portions of tergites III–VI without non-setiferous punctation), antennae with antennomere IV weakly transverse and antennomeres V–X increasingly transverse and of gradually increasing width, and the coloration (head, pronotum, and abdomen black, with the with the posterior margins of the abdominal tergites narrowly dark-reddish; elytra of very variable coloration, nearly uniformly dark-yellowish to blackish with only the humeral angles very indistinctly paler; legs yellowish-brown with brown to dark-brown femora; antennae blackish-brown with antennomeres I–II and X indistinctly paler).

Two of the specimens had been misidentified by R. Pace as *Z. wei*, from which this species is readily distinguished by the different punctation pattern of the abdomen alone (*Z. wei*: anterior impressions of tergites III–V and anterior portions of tergites VI–VII with dense and extensive non-setiferous punctation).

Zyras (Zyras) sp. 13

Material examined: China: 1 ♀, Yunnan, SE Pingbian, 22°55′N, 103°42′E, 2100 m, primary subtropical broad-leaved forest, litter sifted, 28.VIII.2014, leg. Schülke.

This species is of moderately large size (body length 7.0 mm; length of forebody 2.9 mm) and characterized by rather long and massive antennae, rather dense and coarse punctation of the forebody, the presence of rather sparse and not very extensive non-setiferous punctation in the anterior portions of tergites III–VII, and the coloration (body black, with only the humeral angles very indistinctly paler; legs yellowish; antennae blackish; maxillary palpi blackish-brown with the terminal palpomere yellowish).

Zyras (Zyras) sp. 14

Material examined: China: 1 ♀, Yunnan, Lincang Pref., Bangma Shan, 20 km NW Lincang, 23°58′N, 99°55′E, 2210 m, water reservoir, degraded forest with fern, litter and ferns sifted, bank of reservoir, 9.IX.2009, leg. Schülke; 1 ♀, Yunnan, Nujiang Lisu Aut. Pref., Gongshan Co., Gaoligong Shan, stream valley 17 km N Gongshan, 27°55′N, 98°40′E, 1525–1600 m, 20.VI.2005, leg. Smetana.

This species is of similar size, habitus, coloration, and punctation as *Zyras* sp. 13, except as follows: elytral suture and posterior margins of the abdominal tergites narrowly dark-reddish; head sparsely punctate; anterior portions of tergites III–VII with denser and more extensive non-setiferous punctation; antennae shorter and distinctly less massive.

Zyras (Zyras) sp. 15

Material examined: China: 1 ♀ [slightly teneral], Guizhou, Fanjing Shan, 27°54′N, 108°42′E, 1400–1700 m, 5.–11.VI.2014, leg. Reuter.

This species is characterized by relatively small body size (body length 6.5 mm; length of forebody 2.8 mm), a slender habitus with a weakly transverse pronotum, a very irregularly punctate pronotum (punctation distinctly clustered, antero-lateral and postero-lateral portions largely impunctate), the morphology of the antennae (antennomeres I–III very slender, elongate and of similar length; IV weakly oblong; V approximately as broad as long; VI–X of gradually increasing width and increasingly transverse; X approximately 1.15 times as broad as long; antennomere XI elongate, nearly as long as the combined length of VIII–X). The coloration (*Z. shaanxiensis* pattern) is as follows: head blackish; pronotum blackish-brown; elytra yellowish with the postero-lateral portions infuscate; abdomen brown with the posterior margins of the segments pale-reddish; legs yellowish; antennae blackish-brown with antennomeres I–II and the base of III reddish-brown; maxillary palpi reddish-yellow with palpomere III weakly infuscate).

Zyras (Zyras) sp. 16

Material examined: China: 1 ♀, Sichuan, Daliang Shan, road Meigu–Leibo, pass 15 km NE Meigu, 28°25′N, 103°17′E, 27.VII.1997.

This distinctive species (body length 6.3 mm; length of forebody 2.8 mm) is characterized particularly by the massive and distinctly incrassate antennae (antennomeres IV–X increasingly transverse and of distinctly increasing width; antennomere X approximately twice as broad as long; XI rather short, shorter than the combined length of IX and X), by the punctation pattern of the abdomen (anterior impressions of tergites III–V and anterior portions of tergites VI and VII only with few scattered non-setiferous punctures), and by the coloration (head and pronotum blackish; elytra with the anterior half reddish-yellow and the posterior half black; abdomen with tergite III pale-reddish, tergite IV pale-reddish with weakly infuscate middle, tergites V–VII blackish with the anterior margins, the antero-lateral portions, and the paratergites anteriorly reddish, and segments VIII–X pale-reddish with the posterior portion of tergite VIII infuscate; legs yellowish; antennae blackish with antennomeres I–II and base of III reddish, X brown, and XI yellowish; maxillary palpi pale-reddish with the terminal palpomere yellowish).

Zyras (Zyras) sp. 17

Material examined: China: 1 ♀, Shaanxi, Xunyangba, 1.–3.VII.2005, leg. Jeniš; 1 ♀, border Shaanxi/Chongqing, Daba Shan, pass 20 km SSE Zhenping, 31°44′N, 109°35′E, 1700–1800 m, young dry mixed forest, litter and moss sifted, 9.–12.VII.2001, leg. Wrase.

This species is of similar size and coloration as *Z. shaanxiensis*, but distinguished by much more slender and less massive antennae, a distinctly smaller (in relation to head) and less transverse pronotum, the coloration of the abdomen (posterior margins of tergites and paratergites narrowly dark-reddish), and dense non-setiferous punctation of the anterior impressions of the abdominal tergites III–V.

Zyras (Zyras) sp. 18

Material examined: China: 1 ♀, Sichuan, Ganzi Tibet. Aut. Pref., Kangding Co., Daxue Shan, stream valley 15 km S Kangding, 29°56′N, 101°58′E, 2800 m, 26.VI.1999, leg. Wrase; 1 ♀, Sichuan, Daxue Shan, Gongga Shan, 15 km S Kangding, 3200–3500 m, 5.–10.VII.2004, leg. Plutenko; 1 ♀, Yunnan, Dali Bai Aut. Pref., Diancang Shan, pass 43 km NW Dali, 26°00′N, 99°52′E, 3100 m, pasture and shrubs, litter and moss sifted, 23.VIII.2009, leg. Schülke.

This species is of similar size and coloration as *Z. shaanxiensis*, but distinguished by slightly larger body size (body length 6.0–8.3 mm; length of forebody 3.1–3.5 mm), slightly different coloration (abdominal segments more narrowly dark-reddish; legs dark-yellowish), and particularly by the longer and even more massive antennae.

Zyras (Zyras) sp. 19

Material examined: China: 1 ♀, Yunnan, Diqing Tibet. Aut. Pref., Deqin Co., Baima Shan, pass 12 km SE Deqin, 28°24′N, 98°54′E, 4085–4200 m, dry slope with shrubs, 10.VI.2005, leg. Wrase; 1 ♀ [slightly teneral], Yunnan, Diqing Tibet. Aut. Pref., Deqin Co., Meili Xue Shan, 14 km W Deqin, 28°27′N, 98°46′E, 2580 m, stream valley below glacier, mixed forest, leaf litter and moss sifted, 11.VI.2005, leg. Schülke.

This species is of similar size as *Z. shaanxiensis*, but distinguished by a conspicuously massive antennomere I, a more transverse, less convex (cross-section), and more densely punctate pronotum, and by the coloration (elytra uniformly reddish; abdominal tergites III–VII more narrowly and more darkly reddish posteriorly; tergite VIII with completely black posterior portion; legs brown; antennae completely black; maxillary palpi dark-brown, except for the pale-reddish terminal palpomere).

4 Redescriptions of two species from Burma

Zyras (Zyras) setosivestis Scheerpeltz, 1965
(Figs. 9, 70, 123)

Zyras (Zyras) setosivestis Scheerpeltz, 1965: 356 ff.

Type material examined

Holotype ♀: "S. Shan States, Road 40 km. E of Taunggyi, 25.IX.–13.X.34, Malaise / Holotypus / Typus *Zyras setosivestis* O. Scheerpeltz / *Zyras (Zyras) setosivestis* n. sp., det. Scheerpeltz 1941 / 3823, E91 + / NHRS-JLKB 000023269 / *Zyras setosivestis* Scheerpeltz, det. V. Assing 2015" (SMNH).

Comment

The original description is based on a unique female holotype from "S. Shan-States, Road 50 [sic] km E. of Taunggyi" (SCHEERPELTZ 1965).

Redescription

Rather large species; body length 7.2 mm; length of forebody 3.6 mm. Coloration: forebody black (Fig. 70); abdomen (Fig. 123) with segments III–V dark-reddish, VI blackish (except for posterior margin); and VII–VIII dark-reddish; legs: profemora and protibiae blackish-brown, meso- and metafemora bicoloured with the basal halves yellowish and the apical halves blackish, meso- and metatibiae dark-brown with the external side somewhat paler, tarsi brown; antennae (Fig. 9) blackish-brown with antennomere X slightly paler and antennomere XI pale-brown; maxillary palpi yellowish, with palpomere III slightly darker (yellowish-brown).

Head (Fig. 70) distinctly transverse, broadly impunctate along middle; punctation in lateral dorsal portions moderately coarse and moderately dense. Eyes longer than postocular region in dorsal view. Antenna (Fig. 9) 2.6 mm long; antennomere IV oblong; antennomeres V–VI approximately as broad as long; VII weakly transverse; VIII–X increasingly transverse and of gradually increasing width; X approximately 1.5 times as broad as long; XI very short, much shorter than the combined length of IX and X.

Pronotum (Fig. 70) weakly transverse, 1.07 times as broad as long and 1.35 times as broad as head, posteriorly with a pronounced median impression; whole disc, except the narrowly impunctate midline, with moderately dense punctation; antero-lateral portions with numerous very long, erect, and dense dark setae.

Elytra (Fig. 70) 0.8 times as long as pronotum; punctation moderately coarse, dense, and defined; pubescence dense, pale, long, and erect. Hind wings fully developed. Metatarsomere I approximately as long as the combined length of II–IV.

Abdomen (Fig. 123) nearly as broad as elytra, with moderately deep anterior impressions on tergites III–V; lateral portions of sternites with dense, long, pale, and erect pubescence distinctly visible in dorsal view; anterior impressions of tergites III–IV practically impunctate; tergites III–IV with rather numerous, predominantly fine punctures in lateral and posterior portions; tergite V with few non-setiferous punctures in anterior impression and with numerous, mostly fine punctures on remainder of disc; tergites VI–VII with dense and mostly rather coarse punctures practically everywhere; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe.

♂: unknown.

♀: posterior margin of tergite VIII indistinctly concave in the middle; sternite VIII with broadly convex posterior margin.

Comparative notes

From the syntopic *Z. setosipennis*, this species is readily distinguished by the completely different coloration of practically all body parts, shorter antennae, a less transverse pronotum, distinctly paler pubescence, and the different punctation particularly of the abdomen. For characters distinguishing it from the similar *Z. flexus* see the comparative notes in the section on that species.

Distribution and natural history

Zyras setosivestis is known only from the type locality to the east of Taunggyi in Burma, where it was found together with *Z. setosipennis*. Additional data are not available.

Zyras (Zyras) setosipennis Scheerpeltz, 1965
(Figs. 4, 58, 114)

Zyras (Zyras) setosipennis SCHEERPELTZ, 1965: 356 ff.

Type material examined

Holotype ♀: "S. Shan States, Road 40 km. E of Taunggyi, 25.IX.–13.X.34, MALAISE / Holotypus / Typus *Zyras setosipennis* O. Scheerpeltz / *Zyras (Zyras) setosipennis* n. sp., det. SCHEERPELTZ 1941 / 3824, E91 + / NHRS-JLKB 000023268 / *Zyras setosipennis* Scheerpeltz, det. V. ASSING 2015" (SMNH).

Comment

The original description is based on a unique female holotype from "S. Shan-States, Road 40 km E. of Taunggyi" (SCHEERPELTZ 1965). The only significant differences between the holotype of *Z. setosipennis* and that of *Z. chinkiangensis* are the coloration of the forebody (pale-reddish in *Z. setosipennis*, dark-brown in *Z. chinkiangensis*) and the number of yellowish apical antennomeres (four in *Z. setosipennis*, three in *Z. chinkiangensis*). More material is needed to decide whether or not *Z. setosipennis* is a junior synonym of *Z. chinkiangensis*.

Redescription

Body length 7.4 mm; length of forebody 3.8 mm. Coloration: head black; pronotum reddish; elytra pale-reddish (Fig. 58); abdomen (Fig. 114) reddish, with segments VI and VII (except for posterior margins) blackish; legs dark-yellowish; antennae (Fig. 4) black, with the apical four antennomeres pale-yellowish; maxillary palpi blackish, except for the pale-reddish terminal palpomere.

Head (Fig. 58) distinctly transverse, broadly impunctate along middle; punctation in lateral dorsal portions moderately coarse and rather sparse. Eyes distinctly longer than postocular region in dorsal view. Antenna (Fig. 4) 3.0 mm long; antennomeres IV–VI oblong; VII approximately as broad as long; VIII–X weakly transverse; XI much shorter than the combined length of IX and X.

Pronotum (Fig. 58) distinctly transverse, 1.18 times as broad as long and 1.3 times as broad as head, posteriorly with a pronounced median impression; whole disc with moderately dense punctation.

Elytra (Fig. 58) 0.85 times as long as pronotum; punctation moderately coarse, dense, and defined; pubescence dense, dark, long, and erect. Hind wings fully developed. Metatarsomere I approximately as long as the combined length of II–IV.

Abdomen (Fig. 114) nearly as broad as elytra, with rather shallow anterior impressions on tergites III–V; lateral portions of sternites with dense, long, dark, and erect pubescence distinctly visible in dorsal view; anterior impressions of tergites III–V practically impunctate; tergites III–V with some lateral punctures and a transverse row of punctures at or near posterior margin; tergites VI and VII with numerous punctures not arranged in series apparently on whole surface (anterior portion not visible in holotype); integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe.

♂: unknown.

♀: posterior margin of tergite VIII weakly concave in the middle.

Comparative notes

In external characters (coloration of antennae and body; habitus; punctation pattern of abdomen), *Z. setosipennis* is highly similar to *Z. alboantennatus* and *Z. preangeranus* Cameron, 1939 (Java, Borneo; syntype examined). It differs from the former by the coloration of the antennae (*Z. alboantennatus*: apical two to four antennomeres pale-yellowish), the coloration of the elytra (*Z. alboantennatus*: elytra usually bicoloured, exceptionally uniformly reddish), and by the different punctation of the abdomen, particularly the anteriorly impunctate tergites III–V and the less densely punctate tergites VI–VI. From *Z. preangeranus*, it is distinguished by the coloration of the legs (*Z. preangeranus*: meso- and metafemora apically weakly infuscate; profemora and protibiae darker brown) and the abdomen (*Z. preangeranus*: tergite V somewhat infuscate in posterior half; segments VIII–X pale-yellowish), as well as by the punctation of the abdominal tergites VI and VII (*Z. preangeranus*: anteriorly with more extensive fine non-setiferous punctation, posteriorly with much finer and somewhat sparser punctation). Aside from *Z. alboantennatus* and *Z. preangeranus*, *Z. setosipennis* is also similar to *Z. hirtus*, from which it is distinguished by the different coloration of the antennae (*Z. hirtus*: apical antennomeres not distinctly pale-yellowish), larger and more robust body, longer and more slender antennae (*Z. hirtus*: antennomeres V–X distinctly transverse), and the absence of non-setiferous punctation in the anterior impressions of the abdominal tergites III–V.

Distribution and natural history

Zyras setosipennis is known only from the type locality, which is situated to the east of Taunggyi in Burma. Additional data are not available.

5 On some species of *Zyras* sensu strictu from other regions

Zyras (Zyras) haworthi (Stephens, 1832)

Material examined

Portugal: 1 ex., Algarve, Monchique, 37°19′N, 8°34′W, 550 m, *Rubus* litter sifted, 15.IV.2002, leg. Meybohm (cAss); 1 ex., Algarve, Monchique, above road to Alferce, 37°19′N, 8°32′W, 590 m, *Rubus* litter sifted, 10.IV.2002, leg. Meybohm (cAss).

Spain: 2 exs., Lugo, Sierra de Ancares, 2.VIII.1984, leg. Otero (cAss); 1 ex., Girona, Les Guilleries, St. Hilari, 41°55′N, 2°31′E, 660 m, 1.VI.2014, leg. Hernández et al. (NMP).

France: 1 ex., Alpes-Maritimes, Sospel, 500 m, 1.VI.1999, leg. Angelini (cAss).

Germany: 1 ex., Niedersachsen, Stadthagen, forest, pitfall trap, VII.1991, leg. Sprick (cAss); 1 ex., Niedersachsen, Braunschweig env., Immensen, forest, pitfall trap, VII.1989, leg. Wölkerling (cAss); 1 ex., Niedersachsen, Hildesheim-Ochtersum, Trillkegut, 10.VII.2001, leg. Sprick (cAss); 2 exs., Niedersachsen, E Schladen, Hedeper, Westerberg, pitfall, VI.2001, leg. Schmidt (cAss); 1 ex., Nordrhein-Westfalen, Porta Westfalica, Wittekindsberg, 10.VI.1993, leg. Assing (cAss); 1 ex., same locality, 2.VII.1992, leg. Borcherding (cFel); 2 exs., Sachsen-Anhalt, Stendal, Badingen, pitfall trap, 24.VI.1993, leg. Sprick (cAss).

Italy: 2 exs., Toscana, Elba, Cavo (LI), 250 m, 15.V.1998, leg. Angelini (cAss).

Slovenia: 1 ex., Zalog, Zg. Kašeli, 3.VI.1996, leg. Drovenik (cAss).

Serbia: 1 ex., Radan planina, Davolja, Varoš, 1.VI.2009, leg. Stevanović (cAss).

Macedonia: 1 ex., Skopje, VI.1955, leg. Schubert (NHMW).

Bulgaria: 1 ex., Eminska Planina, Vlas, 10.V.1987, leg. Heinig (cAss).

Turkey: 1 ex., Sinop, Çangal Dağı, VII.1961, leg. Schubert (NHMW); 3 exs., Sinop, Sinop env., Lala, 20.V.1976, leg. Besuchet & Löbl (cAss); 1 ex., Rize, Ikizdere, leg. Schubert (NHMW); 1 ex., Rize, 17 km S Ardeşen, 41°03′N, 41°01′E, 350 m, stream bank, leaf litter sifted, 10.VII.2008, leg. Assing (cAss); 1 ex., Artvin, Çifteköprü/Hopa, 1000 m, VI.1977, leg. Schubert (NHMW); 1 ex., Bitlis, Tatvan, 1800 m, V.1976, leg. Schubert (NHMW); 2 exs., Bitlis, Mutki, 1700 m, 25.V.1973, leg. Schubert (NHMW, cAss); 2 exs., Bitlis, Van Lake, Yelkenli, 38°28′N, 42°32′E, 1800 m, pitfall trap, 21.IV.–20.V.2014, leg. Reuter (cFel); 2 exs., Ardahan/Kars, Çildir Gölü, 1800 m, VI.1977, leg. Schubert (NHMW, cAss); 2 exs., Tunceli, Ovacık, 1400 m, VI.1976, leg. Schubert (NHMW, cAss); 2 exs., Mersin, road to Arşlanköy, 5 km SE Aladağ, 36°55′N, 34°32′E, 700 m, 10.V.2004, leg. Besuchet & Meybohm (cAss); 1 ex., Osmaniye, Osmaniye, 300 m, VI.1968, leg. Schubert (NHMW); 1 ex., Hatay, E Yeşilkent, 36°58′N, 36°16′E, 390 m, sifted from under bushes near road, 30.IV.2007, leg. Meybohm (cAss); 1 ex., E Yeşilkent, 36°57′N, 36°15′E, 400 m, 30.IV.2002, leg. Brachat & Meybohm (cAss).

Lebanon: 7 exs., Rayfoun, 33°58′N, 35°42′E, 990 m, oak forest, pitfall trap, 6.V.2013, leg. Reuter (cFel).

Israel: 1 ex., Galilee, Eilon, N Betzet, 20.IV.1982, leg. Besuchet & Löbl (cAss); 1 ex., Upper Galilee, Hurfeish, Mt. Meron, 33°00′N, 35°22′E, 22.II.2005, leg. Starke (cFel).

Russia: 1 ex., W-Caucasus, Krasnodar, 35 km NNE Sochi, Babuk-Aul, 43°53′N, 39°49′E, 560 m, *Fagus orientalis* and *Castanea sativa* forest, litter and bark sifted, 11.VII.2011, leg. Assing (cAss).

Azerbaijan: 1 ex., ca. 15 km SW Lenkoran, 1–5 km W Avrora, 18.–25.V.1993, leg. Napolov (cAss).

Iran: 1 ex., Gilan province, Hashtpar, Gijau, 37°41′N, 48°51′E, 240 m, 1.V.2012, leg. Frenzel (NME).

Middle Asia: 1 ex., "Turkmenien", leg. Leder & Reitter (NHMW).

Comment

According to Smetana (2004), this widespread West Palaearctic species was previously unknown from Azerbaijan, Lebanon, and Israel.

Zyras (Zyras) fulgidus (Gravenhorst, 1806)

Material examined

Germany: 1 ex., Niedersachsen, Northeim env., Weper, pitfall trap, 6.VII.1987, leg. Joger (cAss); 1 ex., Niedersachsen, S Hannover, Alfeld env., Ortsberg, pitfall trap, 29.VI.1986, leg. Assing (cAss); 7 exs., Hessen, Eberschütz, NSG Bunteberg, pitfall trap, 16.VII.1995, leg. Lückmann (cAss, cFel); 1 ex., same data, but 1.VI.1997 (cFel); 1 ex., Sachsen-Anhalt, Halle/Saale, Gimritz, pitfall trap, 16.IX.1992, leg. Teichmann (cFel); 1 ex., same data, but 9.VII.1996 (cFel).

Austria: 4 exs., Niederösterreich, Pfaffenberg, pitfall trap, VII.–X.1965, leg. Malicky (cAss).

Slovenia: 1 ex., Opatje selo, Lokvica, 270 m, 23.VI.–20.VII.2006, leg. Drovenik & Kuntner (cAss); 1 ex., Temnica, Novelo, 360 m, 7.–23.VI.2005, leg. Drovenik (cAss).

Italy: 1 ex., Puglia, Prom. del Gargano, Vico, 650 m, 25.VIII.–6.IX.1986 (cAss); 1 ex., Abruzzi, Collarmele, V.1977, leg. Zwick (cAss); 1 ex., Friuli-Venezia Giulia, Trieste, 4 km SE Basovizza, 10.VIII.1977, leg. Brandmayr (cAss).

Georgia: 1 ♂, Central Caucasus, Shatili–Mutso, 42°37′N, 45°12′E, 1510 m, 15.VII.2015, leg. Brachat & Meybohm (cAss); 1 ♂, Central Caucasus, Shatili–Kristani, 42°38′N, 45°08′E, 1630 m, 16.VII.2015, leg. Brachat & Meybohm (cAss).

Comment

This species is widespread, but rare, in South and southern Central Europe, eastwards to the Middle East, Iran, and European Russia. According to Smetana (2004), it was previously unknown from Slovenia.

Zyras (Zyras) collaris (Paykull, 1800)

Material examined

France: 1 ex., Haute-Corse, Sagone, La Liscia, VII.1988, leg. Frank (cAss).

Belgium: 1 ex., Spa env., moist forest margin, under stone, 6.IV.1983, leg. Assing (cAss).

Germany: 1 ex., Niedersachsen, NW Hannover, Helstorfer Heide, 16.VI.1983, leg. Assing (cAss); 1 ex., same data, but 30.IV.1981 (cAss); 1 ex., Niedersachsen, Lüneburger Heide, Niederhaverbeck, pitfall, 1.VI.1998, leg. Assing (cAss); 1 ex., same data, but 1.VII.1999 (cAss); 1 ex., Nordrhein-Westfalen, Borken env., Vreden, Fürstenbusch, pitfall trap, 16.XI.1992, leg. Terlutter (cFel).

Austria: 2 exs., Burgenland, Apetlon, pasture, pitfall trap, V.1967, leg. Malicky (cAss).

Italy: 2 exs., Toscana, Vinci env., Stabbia, 43°46′N, 10°50′E, 50 m, 15.X.2007, leg. Meybohm (cAss).

Slovenia: 1 ex., Police, Gor. Radgona, 7.III.1998, leg. Drovenik (cAss); 1 ex., same data, but 23.III.1999 (cFel).

Croatia: 3 exs., Istria, 1 km E Marušići, 45°25′N, 13°44′E, 24.VI.1981, leg. Puthz (cAss).

Serbia: 1 ex., Svrljiške Planine, Bare, 15.V.2009, leg. Stevanović (cAss).

Greece: 1 ex., Thessalia, NE Ossa Oros, Stomio, 39°52′N, 22°23′E, 10 m, floodplain forest, 5.IV.1998, leg. Assing (cAss).

Turkey: 1 ex., Artvin, Borçka, 1700 m, VII.1971, leg. Schubert (NHMW); 1 ex., Bitlis, Tatvan, 1900 m, 20.V.1969, leg. Schubert (cAss).

Georgia: 1 ♀, Central Caucasus, Gudani–Zhinvali, 42°27′N, 44°56′E, 1200 m, 19.VII.2015, leg. Brachat & Meybohm (cAss).

Comment

Zyras collaris is widespread and not uncommon in the West Palaearctic region, but was previously unknown from Slovenia, Serbia, and Turkey.

Zyras (Zyras) pictus (Sharp, 1874)

Material examined

Japan: 1 ex., Fukuoka Pref., Munakata, Mt. Jouyama, 13.V.2006, leg. Lackner (cAss).

Comment

Zyras pictus was originally described from Japan and subsequently reported also from North and South Korea (Smetana 2004). The identification of the above specimen was confirmed by Munetoshi Maruyama based on a photo.

Zyras (Zyras) kraatzi Schubert, 1908

Material examined

India: 1 ♂, 1 ♀, Uttarakhand, 5 km E Govind, road to Ghangaria, 9.–10.VI.2011, leg. Shavrin (cAss).

Comment

According to Hlaváč et al. (2011), this species is distributed in the Himalayan region from Himachal Pradesh to Nepal.

Zyras (Zyras) iniquus **n. sp.**
(Figs. 10, 68, 121, 268–269)

Type material

Holotype ♂: "Pakistan: Changla-Gali nw. Murree, 2400 m, 30.VII.–2.VIII.1982, Erber & Heinz leg. / Holotypus ♂ *Zyras iniquus* sp. n., det. V. Assing 2015" (cAss).

Paratype ♂: "Afghanistan, E, Nangarhar prov., Dara-i Nur, 1500 m, 17.VII.2008, leg. Reuter" (cFel).

Etymology

The specific epithet (Latin, adjective: uneven) alludes to the punctation of the pronotum and the male elytra, one of the characters readily distinguishing this species from the similar *Z. kraatzi*.

Description

Body length 7.5–8.2 mm; length of forebody 3.1–3.5 mm. Coloration: body black with the abdominal segments VII–X bright-reddish (Figs. 68, 121); legs with the femora blackish and the tibiae and tarsi brown to dark-brown; antennae (Fig. 10) blackish, with antennomere XI dark-reddish to brown; maxillary palpi blackish with the apical palpomere dark-yellowish.

Head (Fig. 68) distinctly transverse, broadly impunctate along middle; punctation in lateral dorsal portions coarse and rather sparse; interstices on average broader than diameter of punctures. Eyes slightly longer than postocular region in dorsal view. Antenna (Fig. 10) 2.4–2.5 mm long; antennomeres IV approximately as long as broad, V weakly oblong, VI approximately as long as broad, VII–X very weakly transverse, X distinctly less than 1.5 times as broad as long, XI slightly shorter than the combined length of IX and X.

Pronotum (Fig. 68) moderately transverse, 1.09 times as broad as long and 1.30–1.38 times as broad as head, posteriorly with a pronounced median impression; punctation very irregularly distributed, posteriorly and laterally with extensively impunctate places.

Elytra (Fig. 68) 0.80–0.87 times as long as pronotum; punctation sexually dimorphic, sparser posteriorly than anteriorly, in postero-sutural portion extensively impunctate. Hind wings fully developed. Metatarsomere I approximately as long as the combined length of II–IV.

Abdomen (Fig. 121) slightly narrower than elytra; anterior impressions on tergites III–V shallow and with few scattered non-setiferous punctures in the middle; tergites III–V with a lateral puncture on either side and with four setiferous punctures at posterior margin, otherwise impunctate; tergite VI with few non-setiferous punctures in the middle of anterior margin, with a lateral puncture on either side, and with six punctures at posterior margin; tergite VII with few non-setiferous punctures anteriorly, with a lateral setiferous puncture on either side, with a transverse row of 4 punctures at posterior fourth, and a transverse row of approximately 8 punctures near posterior margin; tergite VIII with approximately 20 punctures bearing long dark setae near posterior margin, otherwise impunctate; integument without microsculpture and glossy; posterior margin of tergite VII with palisade fringe.

♂: elytra anteriorly with very dense and distinctly granulose punctation; tergite VIII with a smooth elevation in the middle, posterior margin projecting in the middle, with distinct and sharply defined concavity; posterior margin of sternite VIII convex; median lobe of aedeagus 0.85 mm long, compact; ventral process small in relation to capsule, particularly in ventral view (Figs. 268–269); apical lobe of paramere slender and moderately long.

♀: punctation of elytra sparse anteriorly, not denser than in the middle of disc; tergite VIII without median tubercle, posterior margin weakly concave in the middle; posterior margin of sternite VIII concave in the middle.

Comparative notes

Using the key in Cameron (1939b), *Z. iniquus* would key out together with the similarly coloured *Z. kraatzi*. It is, however, readily distinguished from this species by external characters alone: the much darker legs (*Z. kraatzi*: legs pale-yellowish), the less sparse punctation of the pronotum, and particularly the distinctive punctation of the elytra (*Z. kraatzi*: elytral punctation distinctly less dense anteriorly and not granulose). Moreover, the ventral process of the aedeagus is shorter in relation to the capsule, more slender in lateral view, and less broad in ventral view. *Zyras iniquus* differs from the similar *Z. kambaitiensis* by the much darker legs and maxillary palpi, the reddish antennomere XI, the much sparser punctation of the posterior portion of the elytra, and by the much smaller aedeagus with a ventral process and crista apicalis of different shapes (lateral view).

Distribution and natural history

Based on the catalogue by Hlaváč et al. (2011), *Z. iniquus* is the first representative of *Zyras* sensu strictu to be recorded from Pakistan and Afghanistan. The holotype was collected at an altitude of 2400 m, the paratype at an altitude of 1500 m.

Zyras (Zyras) exasperatus Schubert, 1908

Material examined

India: 1 ex., Uttarakhand, left side of Kosi river, 5 km N Ramnagar, 29.432°N, 79.140°E, 7.–11.VI.2011, leg. Shavrin (cAss).

Comment

This species was previously known only from Himachal Pradesh (Hlaváč et al. 2011).

Zyras (Zyras) preangeranus Cameron, 1939

Zyras (Zyras) preangeranus Cameron, 1939a: 17 f.

Type material examined

Syntype ♂: "F. C. Drescher, G. Tangkoeban Prahoe, 4000–5000 Voet, Preanger. Java, XI.1936 / Chicago Nat. Hist. Mus. (ex Cameron Colln. by exchange with Brit. Mus. Nat. Hist.) / *Zyras preangeranus* Cam. / Syntypus *Zyras preangeranus* Cameron, rev. V. Assing 2015" (FMNH).

Additional material examined

Malaysia: 2 exs., Sarawak (Borneo), ca. 25 km E Kapit, III.1994, leg. Kodada (cAss).

Comment

The original description is based on an unspecified number of syntypes from "G. Tangkoeban Prahoe, alt. 4000–5000 feet" (Cameron 1939a). In coloration, size, habitus, and other external characters, this species is highly similar to *Z. setosipennis* and *Z. alboantennatus*, but readily distinguished by the yellowish abdominal segments VIII–X alone. In addition it differs from both species by the slightly different punctation of the abdomen and by the shape of the median lobe of the aedeagus. This species was previously known only from Java.

Zyras (Zyras) illecebrosus Last, 1982

Zyras (Cephalodonia) illecebrosus Last, 1982: 81 f.

Type material examined

Paratypes: 2 ♂♂: "Mongolia, Central aimak, Tosgoni ov., 1700 m, (6–10 km N Ulan Bator), Z. Kaszab, 4.–8.VI.1968 ex coll. M. Dvořák, National Museum Prage, Czech Republic / Paratypus 1982, *Zyras illecebrosus* Last / *Z. (Cephalodonia) illecebrosus* sp. n., H. R. Last det., Paratype" (NMP).

Comment

This species has been recorded only from Mongolia. It is characterized by the coloration (*shaanxiensis* type with the antennae uniformly reddish, the elytra extensively reddish-yellow, and the margins of the abdominal tergites broadly reddish-yellow), short and distinctly incrassate antennae (antennomere IV 1.5 times as broad as long; antennomeres V–X strongly transverse, X approximately twice as broad as long), a weakly convex pronotum (cross-section), conspicuously dense, not very coarse, and somewhat granulose punctation of the elytra (particularly so in antero-sutural portion), sparse non-setiferous punctation of the anterior portions of tergites III–VI, and the extensive and rather dense setiferous punctation on tergites III–VII (equally distributed on whole of tergal discs). *Zyras illecebrosus* is similar in size, coloration, antennal morphology, and the weakly convex pronotum to *Z. hauseri-anus*, from which it differs particularly by much denser punctation of the elytra and the denser and extensive setiferous punctation on tergites III–VI. It also resembles *Z. inexcisus* in size and the weakly convex pronotum, but is distinguished from it by the reddish antennae and the paler coloration of the elytra and abdomen, the shorter antennae with distinctly more transverse antennomeres IV–X, a more transverse pronotum (1.15–1.20 times as broad as long in *Z. illecebrosus*), the denser and granulose elytral punctation, the denser non-setiferous punctation and the more extensive setiferous punctation of tergites III–VII, and by the smaller and slightly differently shaped median lobe of the aedeagus.

Zyras (Zyras) alternans (Cameron, 1925)

Myrmedonia (Zyras) alternans Cameron, 1925: 45 f.

Material examined

Indonesia: 1 ♂, Java, Jember (FMNH).

Comment

The original description is based on an unspecified number of syntypes, among them at least one male, from "Sumatra, Lago Tuba" (Cameron 1925).

Zyras (Zyras) geminus (Kraatz, 1859)
(Figs. 35, **109**, 165, 278–279, 298–300)

Myrmedonia gemina Kraatz, 1859: 27.

Type material examined

Lectotype ♂ [dissected prior to present study]: "Ceylon, J. Nietner / coll. Kraatz / Syntypus / coll. DEI, Eberswalde / Lectotypus *Zyras geminus* (Kraatz), R. Pace 2002 det." (SDEI). – Paralectotypes: 2 ♂♂ [1 dissected prior to present study]: same data as lectotype (SDEI).

Comment

The original description is based on an unspecified number of syntypes from "Ceylan" (Kraatz 1859). Three male syntypes are deposited in the Kraatz collection at the SDEI. One of them had been designated as the lectotype by Pace (2010b). The external and male sexual characters of one of the paralectotypes are illustrated in Figs. 35, 109, 165, 278–279, 298–300.

Zyras (Zyras) articollis **n. sp.**
(Figs. 34, 100, 158, 280–281)

Type material

Holotype ♂: "N-Laos, 21°07′N, 101°21′E, 15 km NW Luang Namth, 13.–24.V.1997, ca. 750 m, leg. Strba & Hergovits /

Holotypus ♂ *Zyras articollis* sp. n., det. V. Assing 2015" (NHMW).

Paratypes: 1♂: same data as holotype (cAss); 2 exs.: "N-Laos, 21°09′N, 101°18′E, 20 km NW Luang Namth, 5.–11.V.1997, ca. 900 m, leg. Strba & Hergovits" (NHMW).

Etymology

The specific epithet (adjective) alludes to the slender pronotum, one of the characters distinguishing this species from the similar *Z. hongkongensis*.

Description

Body length 6.4–6.6 mm; length of forebody 2.8–3.1 mm. Coloration: head and elytra black; pronotum bright-reddish; abdomen with segments III–V pale-reddish, tergite VI black, with the narrow anterior margin and the antero-lateral portions reddish, and tergites VII–VIII black, with the apical margin of tergite VIII somewhat paler; legs yellowish, with the apices of the meso- and metafemora very weakly and very narrowly infuscate at most; antennae (Fig. 34) blackish with antennomeres IX–XI or X–XI yellowish; maxillary palpi brown, with the terminal palpomere yellowish.

External characters as in *Z. hongkongensis*, except as follows:

Antenna (Fig. 34) more slender; antennomeres IV–V weakly oblong, VI approximately as broad as long, VII–IX increasingly transverse and of gradually increasing width, and X approximately 1.5 times as broad as long. Pronotum (Fig. 100) narrower, only 1.03–1.05 times as broad as long. Abdomen (Fig. 158) with anterior impressions III–V practically impunctate; tergites III–V laterally only with one seta on either side; tergite VI anteriorly only with one irregular transverse series of non-setiferous punctures.

♂: median lobe of aedeagus 0.8 mm long, ventral process very weakly bent in lateral view (Figs. 280–281); parameres as in *Z. hongkongensis* with short, broad, and flattened apical lobes.

Comparative notes

This species is distinguished from the similar *Z. hongkongensis* only by the different coloration of the antennae, the legs, and the abdominal segment VIII, by the slightly more slender antennae, the more slender pronotum, the different punctation of the abdomen, and by the slightly different shape of the median lobe of the aedeagus (crista apicalis more distant from the base of the ventral process). It differs from *Z. geminus*, with which it shares a similar coloration, a similar antennal morphology, and a similarly slender pronotum, by the finer punctation of the pronotum, the finer and denser punctation of the elytra, the punctation pattern of the abdomen (*Z. geminus*: tergite VI with a cluster – not a transverse row – of non-setiferous punctures in antero-median portion), the apically distinctly broader male sternite VIII (*Z. geminus*: male sternite VIII strongly tapering apically and with strongly convex posterior margin), and by the morphology of the aedeagus (*Z. geminus*: median lobe approximately 0.7 mm long; ventral process longer in relation to capsule, more strongly curved and less slender in lateral view; crista apicalis less strongly projecting; apical lobe of paramere slightly shorter). The similarly coloured *Z. particornis* from Japan has much more massive antennae with the apical four antennomeres yellowish, the lateral portions of tergite VI and the antero-lateral portions of tergite VII more extensively yellowish, uniformly yellowish legs, very dense and much more distinct elytral punctation, and very dense non-setiferous punctation in the anterior impressions of tergites III–V.

Distribution

Zyras articollis is currently known only from two localities in northern Laos. The altitudes range from approximately 750 to 900 m.

Zyras (Zyras) thaiorum Pace, 1986

Zyras thaiorum Pace, 1986a: 460.

Material examined

Thailand: 1♂, Doi Pha Hom Pok, Tad Mok waterfall, 20°04′N, 99°16′E, 700 m, leaf litter, 27.I.2014, leg. Ob (cAss).

Comment

The original description is based on a unique male holotype from "Thailand, Chian. [sic] Rai: Mae Yao" deposited in the Museo Civico di Storia Naturale Verona (Pace 1986a). The holotype was not examined, but the above male, including its aedeagus, is in good agreement with the short description and the illustrations provided by Pace (1986a).

Distribution

The known distribution is confined to Thailand (Hlaváč et al. 2011).

Zyras (Zyras) sp. aff. *thaiorum* Pace, 1986

Material examined

Thailand: 2♀♀, Betong, Yala district, Gunung Cang dun village, 26.III.–22.IV.1993, leg. Horak & Strnad (NHMW, cAss).

Comment

The above females most likely represent an undescribed species similar to *Z. thaiorum*, but distinguished by the slight differences in the coloration (antennomeres X–XI or IX–XI yellowish; profemora yellowish brown;

apical halves of meso- and metafemora less strongly infuscate), by distinctly shorter antennae with distinctly transverse antennomeres IX and X, by a more densely punctate pronotum, much finer and denser punctation of the elytra, and by the punctation pattern of the abdomen, particularly the much denser and more extensive non-setiferous punctation of tergites VI–VIII.

Zyras (Zyras) brignolii (Pace, 1986), **n. comb.**

Drusilla brignolii Pace, 1986b: 487.

Comment

This species was described from a unique female holotype collected in "Thailand, Bangkok" deposited in the Museo Civico di Storia Naturale Verona (Pace 1986a). Based on the details indicated in the description and particularly on the illustrations of the habitus and the spermatheca, the specimen clearly belongs to *Zyras* sensu strictu.

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Attagenus (s. str.) *pseudorobustior* n. sp. (Coleoptera: Dermestidae: Attagenini) from Namibia

Andreas Herrmann & Jiří Háva

Abstract

Attagenus pseudorobustior **n. sp.** from Namibia is described, illustrated and compared with the similar species *Attagenus robustior* (Pic, 1951). A list of all *Attagenus* species so far recorded from Namibia is given.

Keywords: Taxonomy, new species, nomenclature, Coleoptera, Dermestidae, Attagenini, *Attagenus*, Namibia.

Zusammenfassung

Attagenus pseudorobustior **n. sp.** aus Namibia wird beschrieben, abgebildet und mit der sehr ähnlich aussehenden Art *Attagenus robustior* (Pic, 1951) verglichen. Alle bisher aus Namibia gemeldeten Arten dieser Gattung werden aufgelistet.

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1 Introduction

Currently the dermestid genus *Attagenus* Latreille, 1802 contains more than 200 known species and subspecies worldwide (Háva 2015), the majority of them belonging into the subgenus *Attagenus* (s. str.). The present paper considers the preceding taxonomical publications on the species of *Attagenus* from the Afrotropical region (e. g. Thunberg 1795, 1815; Reitter 1881; Péringuey 1885, 1886; Kalík 1955; Kalík & Háva 2005; Háva 2003a, 2003b; Herrmann & Háva 2014). During the determination of some material from South Africa deposited in the collection of the SMNS the authors found a new species of the genus *Attagenus* which already was recognised by the deceased coleopterist Vladimir Kalík (1918–2010) as being new to science (see Remarks). This new species is described below.

Acronyms of type depositories

AHEC	Private collection of Andreas Herrmann, Stade, Germany
JHAC	Private Entomological Laboratory and Collection Jiří Háva, Prague, Czech Republic
SMNS	Staatliches Museum für Naturkunde, Stuttgart, Germany

Abbreviations

EW	elytral width = maximum elytral width
TL	total length = distance from anterior margin of pronotum to apex of elytra

Acknowledgements

The authors are deeply indebted to Johannes Reibnitz (SMNS) for taking photos of the new species, and to Dr. Wolfgang Schawaller (SMNS) for the loan of specimens.

2 *Attagenus pseudorobustior* n. sp.

(Figs. 1–4)

Nomen nudum: *Attagenus roeri* Kalík: Schawaller 1994: 27 (see Remarks).

Holotype (♂): "SWA / Namibia, Nyanga, 14.–22.I.1985, leg. H. Roer".

Paratypes (not sexed): 39 specimens, same data as holotype.

All specimens of the newly described species are provided with the following labels: "HOLOTYPE" [or "PARATYPE" respectively]", "*Attagenus pseudorobustior* sp. n., A. Herrmann & J. Háva det. 2015".

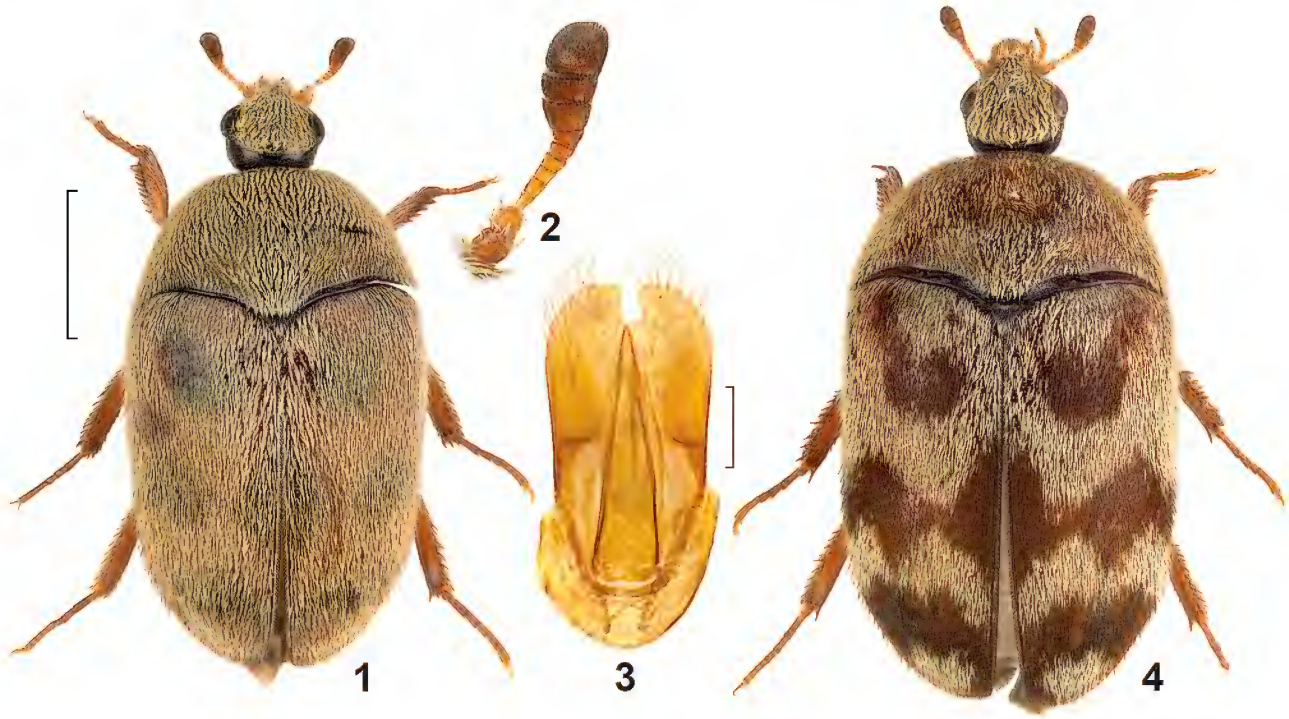
The holotype is stored in SMNS, paratypes are deposited in SMNS, AHEC and JHAC.

Etymology

The name of the new species refers to its similarity to *Attagenus robustior* (Pic, 1951).

Description

Holotype (♂): Body longish ovate, slightly arched. Measurements: TL 3.5 mm, EW 2.1 mm. Head slightly



Figs. 1–4. *Attagenus pseudorobustior* n. sp., ♂ holotype (1–3), ♀ paratype (4). – **1**. Habitus, dorsal aspect. **2**. Antenna. **3**. Aedeagus. **4**. Habitus, dorsal aspect. – Scales: 1 mm (1, 4), y mm (2, 3).

broader than long, sparsely and finely punctate, densely covered with long grey, decumbent hairs; frons flattened and shiny; palpi light brown; Ocellus present on front. Eyes large with hardly visible microsetae. Antennae 11-segmented; antennal club consisting of 3 antennomeres, combined shorter than the shaft (Fig. 2); terminal segment nearly as long as the preceding two segments combined; antennal club brown to darkish brown, shaft light brown. Pronotum twice as broad as long, arcuately narrowed anteriorly, finely and sparsely punctate (like head), cuticula shiny, entirely covered by uniform long grey, decumbent hairs; anterior angles rounded, not visible from above; posterior angles acute with rounded edge, middle of the base convexly extended. Scutellum small and triangular. Punctation and pubescence of the elytra similar to that of head and pronotum, but punctation somewhat more rough and dense; cuticle reddish brown with several indistinct black spots and fasciae, hardly visible because of the dense pubescence as shown in Fig. 1. Legs brown with long and coarse yellow brown pubescence; tarsi roughly as long as tibiae, the latter with strong spines on the exterior edge arranged in two irregular lines. Mesosternum, metasternum and all visible abdominal sternites with the same kind of punctation and pubescence as in elytra. Male genitalia as shown in Fig. 3.

Female: Habitually quite similar to male, slightly more elongated. The antennal club somewhat smaller (as usual in this genus), the spots and fasciae much more distinct than in male, the hairs located on the black elytral parts are darkened (Fig. 4).

Variability: Measurements of paratypes: TL 2.9–3.8 mm, EW 1.8–2.3 mm. Dimension, shape and position of spots and fascia on the elytra are slightly variable.

Differential diagnosis

The new species strongly resembles *Attagenus robustior* (Pic, 1951) (figure of habitus see http://www.dermestidae.com/Attagenusrobustior.html), but differs in the following characters:

A. robustior: Antennal club black, broad; body narrower, pubescence of pronotum with several spots and patches, legs dark brown to black, male genitalia almost circular in dorsal aspect (Congo, Namibia, Senegal, Tanzania).

A. pseudorobustior n. sp.: Antennal club brown and more narrow; body broader, pubescence of pronotum uniform without any spots or patches, legs brown, male genitalia elongated in dorsal aspect (Namibia).

The new species differs from all other species of the genus occurring in Namibia in shape and arrangement of the elytral spots.

Remarks

KALÍK's dermestids are stored in several institutions. Some of them are new to science and already got a name by him and are labelled as types, but they were never published as valid descriptions. This concerns also a couple of beetles labelled as "*Attagenus roeri* sp. n." which are deposited in the collection of the SMNS. This species is now described in the present paper. SCHAWALLER (1994) cited the material from SMNS erroneously under the name *Attagenus roeri* Kalík in his type catalogue of Coleoptera from SMNS.

3 List of the *Attagenus* species from Namibia

Attagenus aurofasciatus Háva, 2005. – Distribution: Namibia, South Africa.
Attagenus cinereus (Thunberg, 1815). – Distribution: Namibia, South Africa.
Attagenus fasciatus (Thunberg, 1795). – Distribution: cosmopolitan.
Attagenus havai Kadej, 2006. – Distribution: Angola, Namibia.
Attagenus heinigi Herrmann & Háva, 2007. – Distribution: Namibia.
Attagenus kaniai Háva & Kadej, 2008. – Distribution: Namibia, Zimbabwe.
Attagenus muehlei Herrmann & Háva, 2014. – Distribution: Namibia.
Attagenus pardus Arrow, 1915. – Distribution: Botswana, Namibia, South Africa, Tanzania, Zimbabwe.
Attagenus pellio (Linnaeus, 1758). – Distribution: cosmopolitan.
Attagenus pseudorobustior n. sp. – Distribution: Namibia.
Attagenus robustior (Pic, 1951). – Distribution: Congo, Namibia, Senegal, Tanzania.

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A new species of *Promethis* Pascoe from West Papua with unusual head armature (Coleoptera: Tenebrionidae: Cnodalonini)

Roland Grimm

Abstract

Promethis skalei **n. sp.** from West Papua is described, illustrated and differentiated from its congeners by unusual head armature and last abdominal ventrite morphology.

Keywords: Tenebrionidae, Cnodalonini, *Promethis*, new species, West Papua.

Zusammenfassung

Promethis skalei **n. sp.** aus West Papua wird beschrieben und abgebildet. Gegenüber den bereits bekannten Arten der Gattung zeichnet sich *P. skalei* durch den apikolateralen Fortsatz der Wangen und den apikalen Zahn des letzten abdominalen Ventrites aus.

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2 Description of the new species 181
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1 Introduction

The species of the genus *Promethis* Pascoe, 1869 (Tenebrionidae: Stenochiinae: Cnodalonini) are typical forest dwellers of the Oriental, Papuan and Australian Regions, and were revised by Kaszab (1988a, b). Further species were described by Ba & Ren (2009) from Hainan Island (China), Grimm (2011, 2013) from Borneo, Masumoto et al. (2005) from Taiwan, Ren & Bai (2005) from Gansu Province (China), Ren & Hua (2006) from Guizhou Province (China), and Ren & Yang (2004) from Guangxi Province (China). André Skale (Hof/Saale, Germany) collected in West Papua a species new for science which is described in the present paper.

Acknowledgements

I am grateful to Johannes Reibnitz (Stuttgart) for taking the photographs and assembling the plate. Liu Shanshan (Baoding) and Dr. Wolfgang Schawaller (Stuttgart) kindly helped in getting copies of papers on Chinese *Promethis*. Dr. Ottó Merkl (Budapest) and Dr. Wolfgang Schawaller (Stuttgart) reviewed the manuscript.

Acronyms of depositories

CRG	Collection Dr. Roland Grimm, Neuenbürg, Germany
SMNS	Staatliches Museum für Naturkunde Stuttgart, Germany

2 Description of the new species

Promethis skalei **n. sp.**
(Figs. 1–2)

Holotype ♂: W Papua, Manokwari prov., 18 km NW Ransiki, Anggi Gida, Kampung Itkau, 1830 m, cutting area, primary forest, 01°24.23′S/133°35.53′E, 4.III.2007, leg. A. Skale (CRG).

Paratypes: Same data as holotype, 1 ♀ (CRG), 1 ♀ (SMNS).

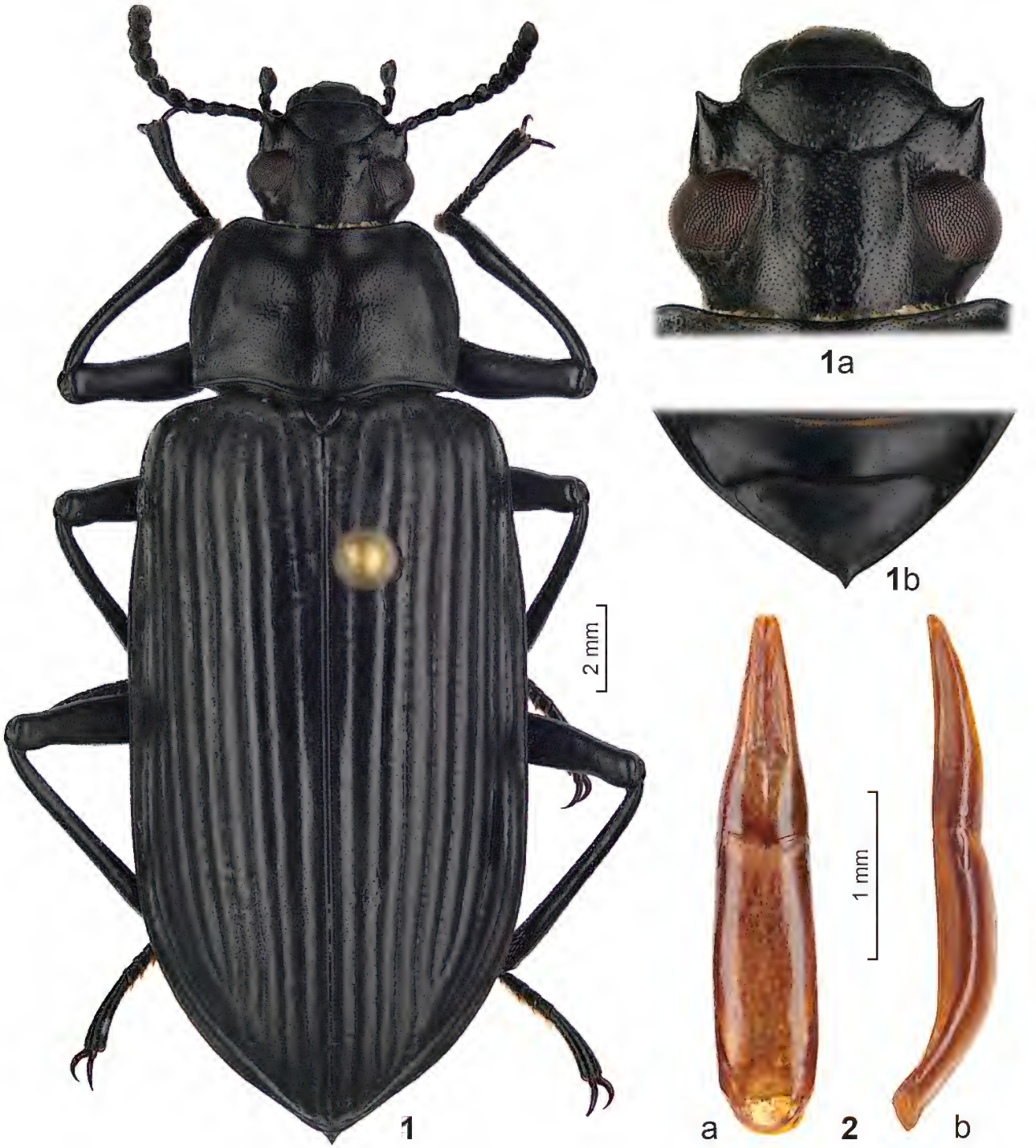
Etymology

This species is named in honour of André Skale (Hof/Saale, Germany), the collector of the type specimens.

Description

Elongate-oval, black, body length 23.6–25.5 mm, body width 9.0–10.0 mm.

Head widest across middle of eyes; anterior border of clypeus straight, laterally arcuate towards clypeo-genal meeting; fronto-clypeal and clypeo-genal sutures well incised, frontal suture insignificant. Genae terminating apico-laterally in a spine-like process (Fig. 1a). Surface densely, but finely punctured. Antennae short, reaching middle of pronotum. Mentum subcordiform, apico-laterally declivous, basal border arcuate; surface in the ♂ densely hirsute; in the ♀♀ densely coarsely to rugosely



Figs. 1–2. *Promethis skalei* n. sp., ♂ holotype. – **1**. Dorsal view. **1a**. Dorsal view of head. **1b**. Ventrites 4–5. **2**. Aedeagus, dorsal (a) and lateral (b) views.

punctured with only scattered long erect hairs (remaining hairs possibly abraded?).

Pronotum widest in the middle, transverse, width/length ratio (measured along transversal and longitudinal midlines) 1.42–1.56. Anterior border shallowly emarginate, lateral borders slightly arcuate towards apical angles, nearly straight and slightly converging towards basal angles, and shallowly emarginate before base. Apical angles obtusely rounded, basal angles subrectangular. All borders distinctly margined, apical margin interrupted in the middle. Surface densely punctured, punctures weakly impressed, with long, adpressed hairs, interspaces weakly microreticulate; disc with basally keeled midlongitudinal sulcus, somewhat flattened along lateral borders. Propleura nearly smooth, basally shallowly rugulose with scattered punctures; apically with fine, scattered punctures or microgranulate. Prosternal process broad, flat, bisulcate, slightly arcuate towards apex.

Elytra striate-punctate; intervals convex, with scattered minute punctures. Lateral margins in dorsal view visible along entire length. Metaventrite rugulose, with interspersed fine, hairy punctures or microgranules. Abdominal ventrite 1 rugulose, with interspersed setigerous punctures; ventrites 2–3 anteriorly rugulose, posteriorly finely punctured; ventrites 4–5 minutely punctured; ventrite 5 not bordered, but apically with distinct tooth (Fig. 1b).

Legs without modifications, but apex of ♂ protibiae widened and flattened ventrally, and fringed with yellow hairs on inner side.

Aedeagus see Fig. 2.

Differential diagnosis

Promethis skalei n. sp. can be easily separated from all described congeners by the apicolateral spine-like process of genae (Fig. 1a) and by the apical tooth of last abdominal ventrite (Fig. 1, 1b).

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Ren, G.-D. & Hua, H.-R. (2006): Tenebrionidae. – In: Li, Z.-Z. & Jin, D.-C. (eds.): Fanjingshan Jingguan Kunchong, pp. 265–274; Guiyang (Guizhou Science and Technology Publishing House) [In Chinese with English summary].

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New and little known species of Tenebrionidae (Coleoptera) from Borneo (6)

Roland Grimm

Abstract

The following new species from Malaysia/Borneo are described: *Palorus borneensis* **n. sp.**, *Platydema orientaloides* **n. sp.**, and *Promethis bosuangi* **n. sp.** *Palorus cerylonoides* (Pascoe, 1836) and *Platydema saundersi* Schawaller, 2012 are recorded for the first time from Borneo. New faunistic data of eight further species are added.

Keywords: Tenebrionidae, Cnodalonini, Diaperini, Palorini, new species, new records; Borneo, Brunei, Malaysia, Sabah, Sarawak.

Zusammenfassung

Folgende neue Arten werden beschrieben: *Palorus borneensis* **n. sp.**, *Platydema orientaloides* **n. sp.** und *Promethis bosuangi* **n. sp.** Neunachweise für Borneo: *Palorus cerylonoides* (Pascoe, 1836) und *Platydema saundersi* Schawaller, 2012. Neue Funde von acht weiteren Arten werden mitgeteilt.

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1 Introduction

In the present sixth contribution to the Tenebrionidae of Borneo a new species of the genus *Palorus* Mulsant, 1854 is described and new faunistic data concerning several other species of the tribe Palorini Matthews, 2003 are dealt with. Furthermore, one new species each of the genera *Platydema* Laporte & Brullé, 1831 and *Promethis* Pascoe, 1869 are described. New faunistic data of eight further species are added.

Acknowledgements

I am grateful to Johannes Reibnitz (Stuttgart) for producing the photographs and arranging them on plates. For loans I thank Drs. Michael Balke (München) and Wolfgang Schawaller (Stuttgart). Thanks are also due to David G. H. Halstead (Old Windsor) for valuable comments concerning the new *Palorus* species, and Drs. Ottó Merkl (Budapest) and Wolfgang Schawaller for reviewing the manuscript.

Acronyms of depositories

CRG	Collection Dr. Roland Grimm, Neuenbürg, Germany
SMNS	Staatliches Museum für Naturkunde, Stuttgart, Germany (Dr. Wolfgang Schawaller)
ZSM	Zoologische Staatssammlung, München, Germany (Dr. Michael Balke)

2 The species

2.1 Tenebrioninae Latreille, 1802
Palorini Matthews, 2003

Palorinus opticus Halstead, 1967

Material examined

Borneo, Malaysia, Sabah, Poring Hot Springs, *Apurosa* sp., lower mountain mixed dipterocarp forest, > 650 m, fog A 51/F 4, 26.I.1993, A. Floren leg., 1 ex. (CRG).

Remarks

Until now only the holotype was known (Grimm 2003, Halstead 1967).

Distribution

Borneo (Grimm 2003, Halstead 1967).

Palorus andrewesi Blair, 1930

Material examined

Borneo, Malaysia, Sabah, E Keningau, Bingkor, 20.–22.III.2007, R. Grimm leg., 2 ex. (CRG).

Distribution

Borneo (E Malaysia/Sabah), India, Singapore (HALSTEAD 1967). Indonesia (Bali, Sumatra), Laos, Thailand, W Malaysia (new records based on specimens in CRG, SMNS, and ZSM).

Palorus austrinus Champion, 1896

Material examined

Borneo, Malaysia, Sabah, 23 km NE Kota Belud, 80 m, 16.II.2006, R. GRIMM leg., 1 ex. (CRG). – Borneo, Malaysia, Sabah, E Keningau, Bingkor, 20.–22.III.2007, R. GRIMM leg., 2 ex. (CRG). – Borneo, Malaysia, Sabah, Keningau, 17.–19.II.2006, R. GRIMM leg., 1 ex. (CRG). – Borneo, Malaysia, Sabah, 10 km W Keningau, 24.XI.2006, R. GRIMM leg., 2 ex. (CRG). – Borneo, Malaysia, Sabah, 10 miles point from Keningau, 8.III.1993, T. UENO leg., 1 ex. (ZSM). – Borneo, Malaysia, Sabah, S Tenom, Tomani, 23.XI.2006, R. GRIMM leg., 2 ex. (CRG). – Borneo, Malaysia, Sabah, Tamang Bunsit, near Keningau, 13.–14.III.1993, T. UENO leg., 1 ex. (ZSM). – Borneo, Malaysia, Sabah, 23 km NE Tenom, 10.V.2005, R. GRIMM leg., 2 ex. (CRG).

Distribution

Australia, Borneo (Brunei, E Malaysia/Sabah), Philippines (HALSTEAD 1967). Indonesia: Bali (new record based on specimens in CRG).

Palorus borneensis **n. sp.**
(Figs. 3, 3a, 3b)

Holotype ♂: Borneo, [Malaysia], Sabah, Crocker Mts., Gunung Emas env., 15.–27.IV.1993, I. JENIŠ & M. ŠTRBA leg. (CRG). / *Palorus* sp. n. aff. *carinicollis* (Gebien), R. GRIMM det. 2004. / *Palorus* sp. n., D. G. H. HALSTEAD det. 2004.

Etymology

The species name refers to Borneo where the holotype was collected.

Description

Body oblong, length 3.3 mm, width 1.2 mm, ferruginous; micro-reticulation shallow, more distinct on pronotum than on elytra.

Head with genae produced into subtriangular, foliate horns with truncate apex; with distinct depression on each side next to eyes; eyes large.

Pronotum transverse, width/length ratio 1.29, with distinct lateral longitudinal depressions; disc slightly convex between depressions, then steeply declivous towards explanate lateral margin. Apical margin shallowly bisinuate, basal margin and lateral margins nearly straight; all margins bordered, border of apical margin interrupted in the middle. Surface coarsely and densely punctured; distances between punctures smaller than diameters of punctures.

Elytra with striae of punctures, intervals only with minute punctures arranged in one row.

Aedeagus see Fig. 3a.

Differential diagnosis

From the Oriental Region so far no *Palorus* with genal horns were known. *Palorus borneensis* n. sp. is similar to the Ethiopian *P. carinicollis* (Gebien, 1907). However, in males of *P. carinicollis* usually the apical pronotal margin is produced horizontally in the midline (HALSTEAD 1967: fig. 5). The pronotum of *P. carinicollis* is somewhat finer and less densely punctured; the distances between punctures are equal to or larger than diameters of punctures. The intervals of the elytra are with larger punctures and the species differ in the shape of the aedeagus (Figs. 3a, 4).

Palorus cerylonoides (Pascoe, 1836)

Material examined

Borneo, Malaysia, Sabah, Poring Hot Springs, 450–600 m, 9.–11.III.2007, W. SCHAWALLER leg., 1 ex. (SMNS).

Distribution

Probably of Indo-Malayan origin (HALSTEAD 1967). Widespread in the Oriental and Ethiopian Regions, and also found in the Palaearctic Region: Fiji, "French West Africa", Great Britain, India, Iran, Japan, Madagascar, Mariana Is., Marquesas Is., Myanmar, New Guinea, Philippines, Samoan Is., Seychelles, Solomon Is., Vietnam (HALSTEAD 1967: map 2, p. 109). Borneo (new record), Indonesia (Java), Laos, Thailand, Vietnam (new records based on specimens in CRG, SMNS, and ZSM).

Platycotylus nitidulus (Macleay, 1872)

Material examined

Borneo, Malaysia, Sabah, 23 km NE Tenom, 10.V.2005, R. GRIMM leg., 6 ex. (CRG). – Borneo, Malaysia, Sabah, Tambunan, 16.–19.I.2010, R. GRIMM leg., 1 ex. (CRG). – Borneo, Malaysia, Sabah, Mt. Kinabalu Nat. Park, HQ area, 1500–1650 m, 23.–26.III.2015, R. GRIMM leg., 1 ex. (CRG). – Borneo, Malaysia, Sabah, Kampung Takala, Kinabatangan river, 5.VI.1989, J. KODADA & F. ČIAMPOR leg., 1 ex. (SMNS). – Borneo, Malaysia, Sabah, Mt. Kinabalu Nat. Park, Poring Hot Springs, 600 m, 6°03′N/116°42′E, D. BARTSCH & C. HÄUSER leg., 1 ex. (SMNS). – Borneo, Malaysia, Sarawak, Belaga, Long Linau, 17.–21.III.1990, A. RIEDEL leg., 1 ex. (SMNS).

Distribution

Australia (Queensland), Borneo (E Malaysia/Sabah), India incl. Andaman Is., Indonesia (Ceram, West Papua), Key Is., Laos, Nepal, New Guinea, Thailand, Vietnam (GEBIEN 1940, KASZAB 1965, 1973, 1980 [all under *Doliema* Pascoe, 1860], MERKL 1992). Indonesia (Sumatra), W Malaysia (new records based on specimens in SMNS and ZSM).

Platycotylus parvicollis (Pic, 1923)

Material examined

Borneo, Brunei, Muara, Bandar Seri Begawan, 10.V.1995, E. Heiss leg., 1 ex. (CRG). – Borneo, Malaysia, Sabah, Tambunan, 16.–19.I.2010, R. Grimm leg., 2 ex. (CRG).

Distribution

Borneo, Philippines, Indonesia (Sumatra), Thailand, Vietnam (Gebien 1940 under *Doliema* Pascoe, 1860, Merkl 1992). India, W Malaysia (new records based on specimens in SMNS).

Ulomina carinata Baudi di Selve, 1876

Material examined

Borneo, Malaysia, Sabah, E Keningau, Bingkor, 20.–22.III.2007, R. Grimm leg., 3 ex. (CRG). – Borneo, Malaysia, Sabah, NW Keningau, Keningau–Kimanis, 600 m, 7.II.2006, R. Grimm leg., 4 ex. (CRG).

Distribution

According to Halstead (1967) [under *Coelopalorus foveicollis* (Blair, 1930)] it is of Oriental origin and widely distributed with stored products. Borneo (E Malaysia/Sabah/Sarawak); Cocos Keeling Is., Great Britain, Guam Is., Guyana, Hawaiian Is. (Hawaii, Oahu), India incl. Andaman Is., Indonesia (Java, Sulawesi, Sumatra), Kenya, Laos, Myanmar, Nepal, Philippines (Luzon, Mindanao), Sri Lanka, Taiwan, Thailand, Tanzania, Trinidad, U.S.A., Vietnam, W Malaysia (Grimm 2004, Halstead 1967). Italy (Scupola 2002).

Ulomina martinae Scupola, 2002

Material examined

Borneo, Malaysia, Sabah, 10 miles point from Keningau, 8.III.1993, T. Ueno leg., 1 ex. (ZSM).

Distribution

Borneo (Sabah), China (Hainan), Hawaiian Is. (Oahu), India, Indonesia (Java), Laos, Sri Lanka, Thailand, Vietnam, W Malaysia (Grimm 2004, Halstead 1967) [Halstead's records under *Coelopalorus carinatus* (Blair, 1930)]. Indonesia (Sulawesi) (new record based on specimen in ZSM).

2.2 Diaperinae Latreille, 1802
Diaperini Latreille, 1802

Neomida tricornis (Gebien, 1925)

Material examined

Borneo, Malaysia, Sarawak, Santubong Peninsula, Permai Rainforest Resort, 20–150 m, 13.–15.III.2008, R. Grimm leg., 1 ex. (CRG). – Same data, but 23.–27.III.2009, R. Grimm leg. 1 ex. (CRG). – Same data, but 14.–26.II.2012, R. Grimm leg., 8 ex. (CRG). – Borneo, Malaysia, Sarawak, Kubah Nat. Park, HQ area, 160–300 m, 25.–27.II.2012, R. Grimm leg., 31 ex. (CRG).

Distribution

Borneo (E Malaysia/Sabah, Indonesia/Kalimantan), Indonesia (Sulawesi, Sumatra) (Schawaller 2002). Borneo (E Malaysia/Sarawak) (new record).

Platydema orientaloides **n. sp.**
(Figs. 2, 2a)

Holotype ♂: Borneo, Malaysia, Sabah, Danum Valley Conservation Area, Borneo Rainforest Lodge, 1.–3.IV.2013, R. Grimm leg. (CRG).

Etymology

Orientaloides = orientalis-like.

Description

Body oblong, subcylindrical, ferruginous, shining, length 3.6 mm, width 1.75 mm.

Head with distinct punctation. Frons with two symmetrical, short and broad horns, without setation. Clypeus with minute antero-clypeal tubercle. Length/width ratio of antennomeres 1 to 11 as 5:3 / 1:1 / 4:2.5 / 3:3.5 / 2:3 / 1:2 / 1:2 / 1:2 / 1:2 / 1:2 / 1:1; antennomere 3 long.

Pronotum transverse, broadest near base, transversely convex, punctured as on head. Basal margin shallowly bisinuate; lateral margins nearly straight in basal half, weakly rounded towards apex; apical margin finely bordered; border of lateral margins distinctly stronger; basal margin only finely bordered in the sinuosity besides middle. Anterior and posterior angels broadly rounded. Propleura wrinkled with long setation.

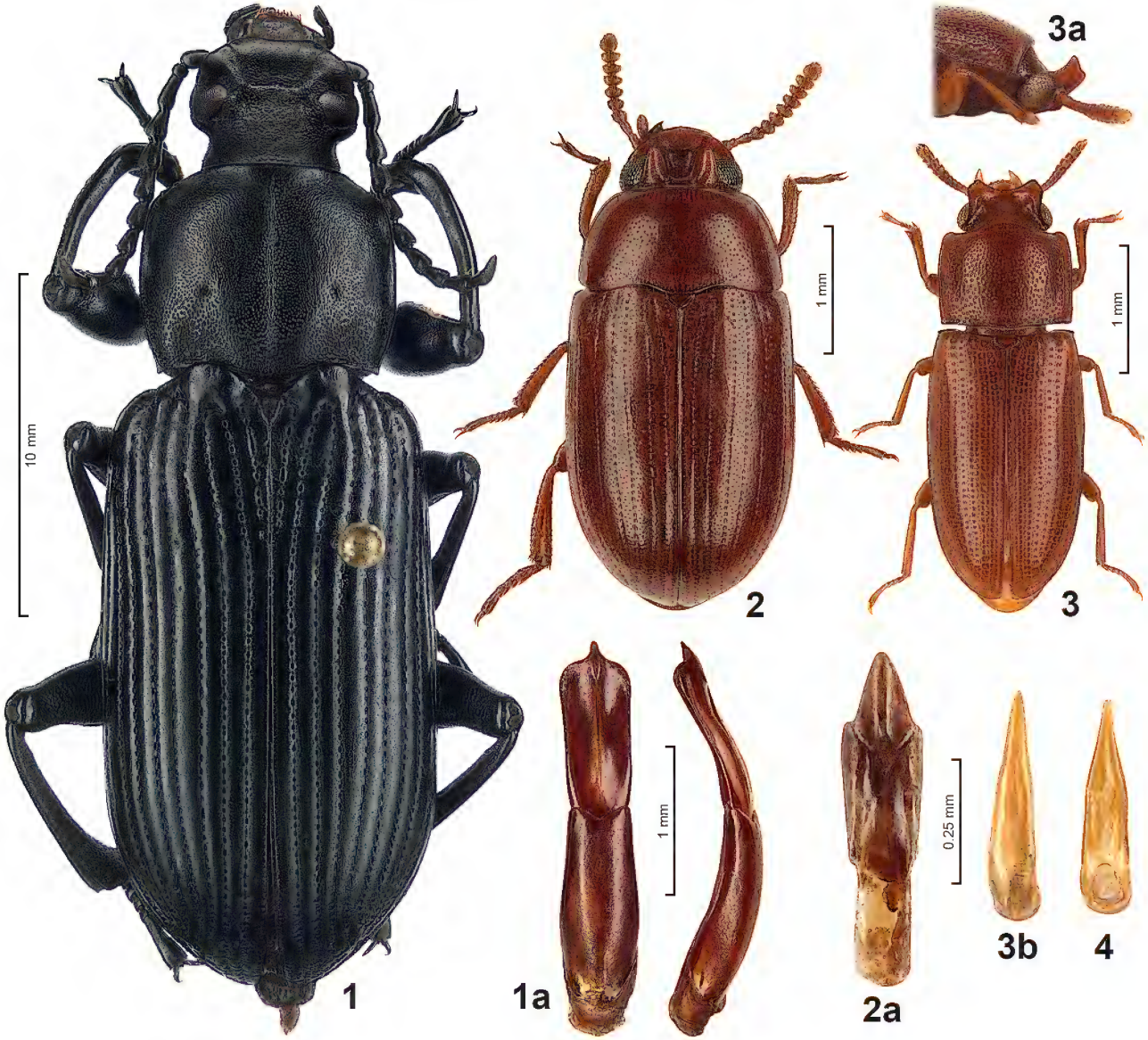
Elytra convex transversely, subparallel-sided, length/width ratio = 1.43; besides scutellar striole with 8 rows of punctures, third row with 48 punctures; intervals flat, with 2–3 irregular rows of punctures distinctly finer as on pronotum; lateral margins in dorsal view visible throughout nearly entire length, concealed only near apex.

Legs without modifications.

Aedeagus see Fig. 2a.

Differential diagnosis

Platydema orientaloides n. sp. has a subcylindrical body shape similar to *P. orientalis* Gebien, 1911, known from Myanmar, Thailand and Vietnam (Schawaller 2004), but the latter species is distinctly larger (body length 5.5–6.7 mm), its body is castaneous to piceous, and it differs conspicuously in the shape of the aedeagus (compare Fig. 2a with fig. 126 of Schawaller 2004).



Figs. 1–4. Tenebrionidae spp., dorsal views (1, 2, 3), lateral view of head (3a), aedeagi, dorsal (1a left, 2a, 3b, 4) and lateral (1a right) views. – **1**, **1a**. *Promethis bosuangi* n. sp. ♂ holotype. **2**, **2a**. *Platydema orientaloides* n. sp. ♂ holotype. **3**, **3a**, **3b**. *Palorus borneensis* n. sp. ♂ holotype. **4**. *Palorus carinicollis* (Gebien).

Platydema saundersi Schawaller, 2012

Material examined

Borneo, Malaysia, Sabah, Mt. Kinabalu Nat. Park, Poring Hot Springs, 525 m, 12.–13.IV.2015, R. Grimm leg., 1 ♀ (CRG).

Distribution

Singapore, Sulawesi (Schawaller 2012), Borneo (E Malaysia/Sabah) (new record).

2.3 Stenochiinae Kirby, 1837
Cnodalonini Gistel, 1856

Promethis bosuangi **n. sp.**
(Figs. 1, 1a)

Holotype ♂: Borneo, Malaysia, Sabah, NW Danum Valley Conservation Area, Kuamut, 700 m, 22.I.2015, S. Bosuang leg. (CRG).

Etymology

This species is named in honour of Dr. STEVEN BOSUANG (Kota Kinabalu), the collector of the holotype.

Description

Elongate, robust, black, body length 28 mm, body width 10 mm.

Head widest across middle of eyes; labrum in the middle weakly transversely keeled; anterior border of clypeus shallowly emarginate, laterally straight towards clypeogenal meeting; fronto-clypeal suture strongly, clypeogenal suture finer, but well incised. Clypeus lower than genae and frons, genae raised. Temples strong, embracing hind border of eyes. Frons next to eyes with elevation and close beside it deeply, longitudinally impressed. Genae and clypeus finely punctured apically, punctures becoming coarser towards clypeo-frontal suture and here transversely rugose; elevations next to eyes and adjacent impressions very coarsely punctured. Antennae long, almost reaching base of pronotum; antennomeres 4–10 on inner side densely, coarsely punctured, apically with some long hairs; terminal antennomere distinctly ciliated apically on inner side. Mentum subcordiform, with apical border shallowly emarginate and basal border straight; surface densely rugosely punctured and hirsute.

Pronotum transversely convex, widest in the middle, subquadrate, width/length ratio 0.86 (measured along transversal and longitudinal midlines). Anterior margin straight; lateral margins anteriorly broadly arcuate towards apex, posteriorly slightly converging towards base, base bisinuate; posterior angles acute, dentiform. All margins distinctly bordered; border of apical and basal margins laterally fine, broadening towards middle; broad part in the middle of apical border obliterated. Surface densely punctured, punctation coarsely confluent at places, particularly basally; with shallow mid-longitudinal impression and with a small, round, shallow impression in posterior third between midline and lateral margin. Propleura coarsely to rugosely punctured. Prosternal process broad, arcuate towards apex; shallowly, coarsely transversely corrugate bisulcate; between sulci and inner borders of procoxae raised and embracing basal inner part of coxae.

Elytra striate-punctate; intervals convex, with scattered minute punctures, nearly smooth; lateral margins in dorsal view visible along entire length; pseudopleura in anterior half smooth, in posterior half transversely rugose; basal margins in inner half besides scutellum with broad, horizontal, nearly semicircular protuberance, overlapping partly base of pronotum (Fig. 1). Scutellum elongate triangular. Metaventrite nearly smooth in the middle, with punctures becoming more distinct laterally; basally with transversely rugose impression in the middle. Abdominal ventrites densely, finely punctured; ventrite 5 bordered.

Legs. Profemora short, with inner side basally deeply emarginate, forming a clinched club with short handle; behind emargination with small tumefaction. Protibiae apically widened and strongly curved inwards, beyond the attachment of protarsi tooth-like extended and here dorsally excavated and externally pilose. Mesotibia and metatibia apically dilated, and here ventrally fringed.

Aedeagus see Fig. 1a. Apicale abruptly constricted before apex, acuminate tip without barbed hooks.

Differential diagnosis

Promethis bosuangi n. sp. is characterized by the elytral protuberance, clavate profemora, shape of apex of protibiae, characters of antennomeres, and shape of apicale of aedeagus and can thus be easily separated from all known congeners.

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The genus *Menimus* Sharp (Coleoptera: Tenebrionidae: Gnathidiini) in India, with descriptions of two new species[1]

Wolfgang Schawaller

Abstract

The species of the tenebrionid genus *Menimus* Sharp, 1876 (Gnathidiini Gebien, 1921, Diaperinae) from India are revised, and an identification key for the species is compiled. New species: *M. gairibansicus* **n. sp.** (Darjeeling), *M. hunlicus* **n. sp.** (Arunachal Pradesh). New synonym: *M. indicus* Gebien, 1925 **n. syn.** of *M. ovalis* (Allard, 1894). Lectotypes are designated for *M. caraboides* (Allard, 1894) and *M. ovalis* (Allard, 1894).

Keywords: Coleoptera, Tenebrionidae, Diaperinae, Gnathidiini, *Menimus*, new species, new synonym, India.

Zusammenfassung

Die Arten der Tenebrioniden-Gattung *Menimus* Sharp, 1876 (Gnathidiini Gebien, 1921, Diaperinae) aus Indien werden revidiert, ein Bestimmungsschlüssel für die Arten wird erstellt. Neue Arten: *M. gairibansicus* **n. sp.** (Darjeeling), *M. hunlicus* **n. sp.** (Arunachal Pradesh). Neues Synonym: *M. indicus* Gebien, 1925 **n. syn.** von *M. ovalis* (Allard, 1894). Lectotypen werden designiert für *M. caraboides* (Allard, 1894) und *M. ovalis* (Allard, 1894).

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1 Introduction

The tenebrionid genus *Menimus* Sharp, 1876 (Gnathidiini Gebien, 1921, Diaperinae) contains more than 70 species, distributed in the Oriental, Papuan and Pacific regions with a few species reaching the southern areas of the Palaearctic region in Japan, Sikkim (Kaszab 1982) and Yunnan (Medvedev 2007). Medvedev (2007) described the first three species from China (Yunnan), listed the species composition of the complete genus with full references, synonymised *Neomenimus* Kaszab, 1939, and discussed some particular morphological features. Schawaller (2009) added two further species from Yunnan, one of them being completely blind.

Our knowledge about *Menimus* in India is quite poor. Allard (1894a) described two species under *Chariotheca*, and (1894b) a third one also under *Chariotheca*, all from southern India (Tamil Nadu). The latter, however is not a tenebrionid based on the re-examination of the type series by the author. Gebien (1925) transferred Allard's species to *Menimus*, but without study of Allard's types, and described a further species from southern India. Kaszab (1982) presented an additional species from Sikkim, figured by Schawaller (2009). Newly collected material of this genus from north-eastern India, representing two species new to science, induced me to deal with the Indian *Menimus* in a comprehensive way. Added is also the first record of *Menimus belousovi* from adjacent northern Burma, originally described from Yunnan by Medvedev (2007). The two known species from adjacent Sri Lanka (Kaszab 1980) are not included in this paper.

The species of *Menimus* have an epigean way of life in mature forests. Nearly all congeners occur only in small areas, and the species treated herein live either in southern India (two species), or disjunct in north-eastern India and adjacent Burma (four species). One of the herein described species (*M. gairibansicus* n. sp.) has completely reduced wings, whereas the other described species (*M. hunlicus* n. sp.) has fully developed wings. Additionally, both species have a distinctly different shape of the aedeagus (compare Figs. 8, 11). Although the reduction of characters is of less phylogenetic value, the other differences mainly in the articulation of the antennomeres suggest that *Menimus* in the present scope may not be monophyletic.

[1] Contributions to Tenebrionidae, no. 134. – For no. 133 see: Annals of the Ditsong National Museum of Natural History Pretoria 6 (2016).

Acronyms of depositories

HNHM	Hungarian Natural History Museum, Budapest, Hungary
MNHN	Muséum National d'Histoire Naturelle, Paris, France
NHMB	Naturhistorisches Museum, Basel, Switzerland
SMNS	Staatliches Museum für Naturkunde, Stuttgart, Germany
ZFMK	Zoologisches Forschungsmuseum Koenig, Bonn, Germany

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For the trustful loan of specimens I cordially thank Dr. Dirk Ahrens (Bonn), Antoine Mantilleri (Paris), Dr. Ottó Merkl (Budapest), and Isabelle Zürcher (Basel). The photographs were taken by Johannes Reibnitz (Stuttgart) with a Leica DFC320 digital camera on a Leica MZ16 APO microscope and subsequently processed by him with Auto-Montage (Syncroscopy) software. The referees Dr. Roland Grimm (Neuenbürg) and Dr. Ottó Merkl kindly improved the manuscript by their comments.

2 New species of *Menimus* from India

Menimus gairibansicus n. sp.
(Figs. 2, 8)

Holotype (♂): NE India, West Bengal, Darjeeling Distr., Gairibans, 2600 m, 4.–6.VI.2006, leg. E. Kučera, SMNS.

Etymology: Named after the village Gairibans, where the type was collected.

Description: Body length 5.5 mm, body shape ovate, highly convex. Dorsal side dark ferrugineous without colour pattern, without metallic shine, surface shining and without distinct setation, even without microsetae in punctures, antennae and legs lighter. Head with punctation larger than on pronotum. Eyes small, not prominent. Antennae (Fig. 2) with antennomeres 8–10 forming a 3-segmented club and with antennomeres 9 and 10 fused; antennomeres 3–7 wider than long. Pronotum widest behind middle, anterior corners slightly protruding, posterior corners rectangular, lateral margins rounded, basal and distal margins unbordered in the middle; surface shining with punctation distinctly finer and sparser than on head, disc convex without any impressions; propleura scattered with similar punctation as pronotum, surface feebly wrinkled and shagreened; prosternal apophysis prominent, pointing posteriorly. Wings completely reduced. Elytra short ovate, 1.2 times as wide as long, widest in the middle, complete elytra with irregular, not confluent punctuation, without traces of punctural rows, punctures larger than pronotal punctures; lateral margin visible in dorsal view only in the anterior quarter, humeral angles pronounced, lateral margin with extremely fine dentation; epipleura diminishing somewhat before apex, with small scattered punctures, punctures smaller than those on metaventrite. Abdominal ventrites with punctation, medial punctures as small as on pronotum, lateral ones somewhat larger, last ventrite 5 unbordered and without modifications. Legs without specific characters, tibiae rounded in cross section and without keel. Aedeagus (Fig. 8) with broad apicale with rounded apex, basale straight in lateral view and with weakly hooked base.

Diagnosis: *Menimus gairibansicus* n. sp. is quite similar to *M. wittmeri* Kaszab, 1982 from Sikkim, both share a similar body size and high convex shape, the irregular elytral punctation, the shape of the antennae with antennomeres 8–10 forming a 3-segmented club and with antennomeres 9 and 10 fused, and the shape of the aedeagus. Both can be separated by the shape of the pronotum: pronotum widest at base with lateral margins parallel in basal part in *M. wittmeri*, pronotum widest before base and lateral margins rounded in basal part in *M. gairibansicus* n. sp. (Fig. 3). *M. belousovi* Medvedev, 2007 from Yunnan and north-eastern Burma (see below), also belongs to the same group, also with a 3-segmented antennal club, but without fused antennomeres 9 and 10 (Fig. 1).

Menimus hunlicus n. sp.
(Figs. 5, 11)

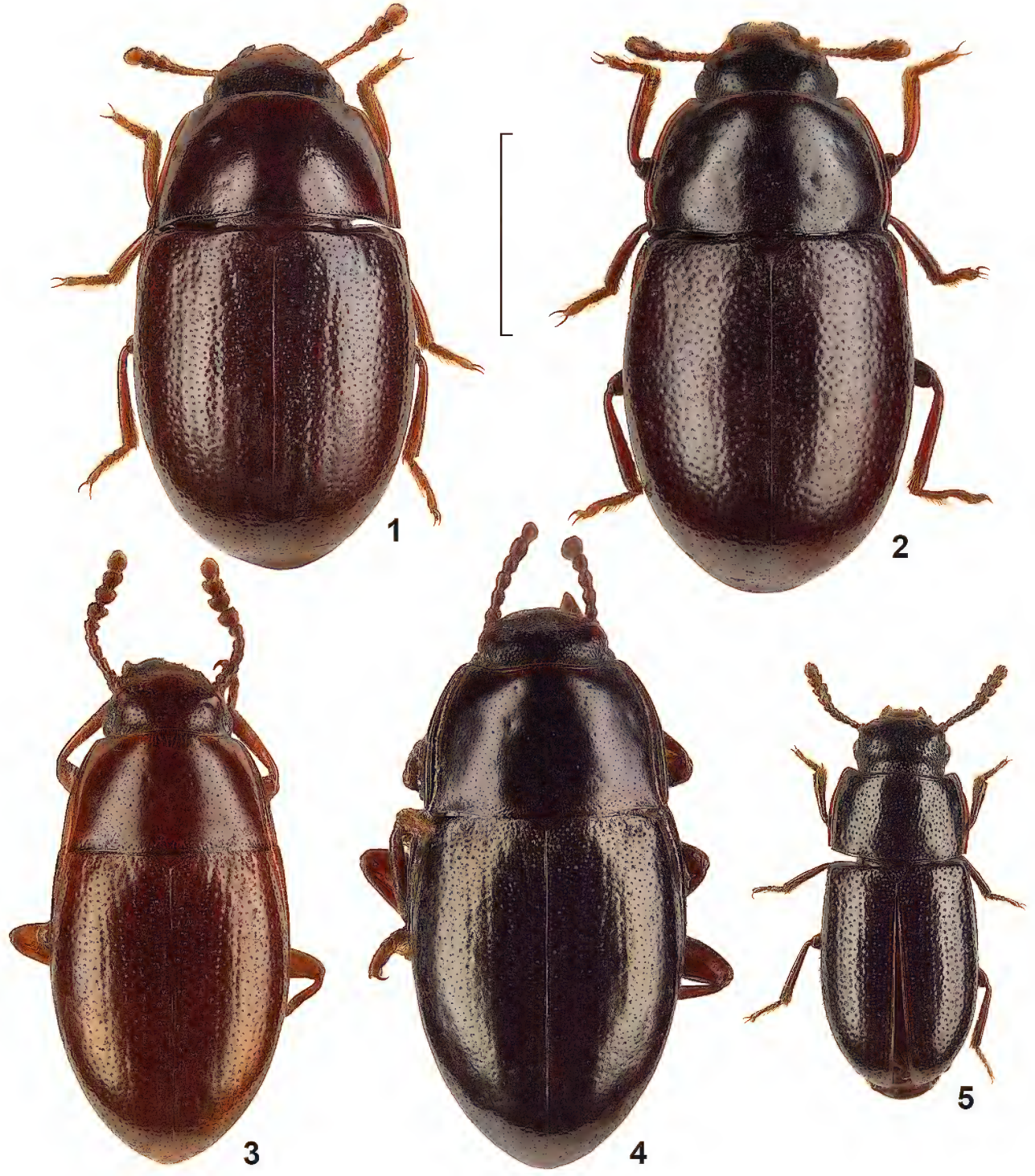
Holotype (♂): NE India, Arunachal Pradesh, Lower Dibang Valley Distr., Hunli, 1300 m, 26.V.–1.VI.2012, leg. L. Dembický, ZFMK.

Paratypes: Same data as holotype, 70 ex. ZFMK, 4 ex. HNHM, 4 ex. SMNS. – NE India, Arunachal Pradesh, Roing, 500 m, 23.–28.V.2007, leg. P. Pacholátko, 1 ex. NHMB.

Etymology: Named after the village Hunli, where the largest part of the type series was collected.

Description: Body length 3.0–3.7 mm, body shape elongate parallel. Dorsal side blackish without colour pattern, without metallic shine, surface shining and without distinct setation, only with a few microsetae, antennae and legs lighter. Head with punctation slightly larger than on pronotum. Eyes small, not prominent. Antennae (Fig. 5) with 4-segmented club (antennomeres 7–10), all antennomeres separated and not fused, antennomeres 3–6 wider than long. Pronotum widest in the middle, anterior corners slightly protruding, posterior corners rectangular, lateral margins rounded, basal margin completely bordered, distal margin unbordered in the middle; surface shining, with punctation distinctly finer and sparser than on head, disc convex, without any impressions; propleura scattered with similar punctation as pronotum, surface feebly wrinkled and shagreened; prosternal apophysis not prominent, bent down. Wings completely developed. Elytra elongate parallel, 1.6 times as wide as long, widest at base, elytra with irregular, not confluent punctural rows, punctures larger than pronotal punctures, intervals with a row of sparser and somewhat smaller punctures; lateral margin

visible in dorsal view nearly throughout whole length, humeral angles pronounced, lateral margin with fine dentation; epipleura diminishing somewhat before apex, scattered with small punctures, punctures smaller than those on metaventrite. Abdominal ventrites with punctation, medial punctures as small as on pronotum, lateral ones somewhat larger, last ventrite 5 unbordered and without modifications. Legs without specific characters,



Figs. 1–5. *Menimus* spp., dorsal view. – **1**. *M. belousovi*, ♂ non-type Burma, SMNS. **2**. *M. gairibansicus* n. sp., ♂ holotype SMNS. **3**. *M. ovalis*, ♂ lectotype MNHN. **4**. *M. caraboides*, ♂ lectotype MNHN. **5**. *M. hunlicus* n. sp., ♂ holotype ZFMK. – Scale: 2 mm.

tibiae rounded in cross section and without keel. Aedeagus (Fig. 11) with broad finger-like apicale distinctly bent downwards in lateral view, basale nearly straight in lateral view and without hooked base.

Diagnosis: *Menimus hunlicus* n. sp. can be recognised among the Indian congeners by small body size less than 4 mm (all other species around 5 mm), by elongate parallel-sided body (all other ovate), by the antennae with 4-segmented club, and by a completely different shape of the aedeagus (compare Figs. 1–11).

3 Known species of *Menimus* from India and adjacent Burma

Menimus belousovi Medvedev, 2007
(Figs. 1, 6)

Examined material: NE Burma, Kambaiti, 7000 ft. (2100 m), IV.1934, leg. R. Malaise, 8 ex. NHMB, 3 ex. SMNS, 2 ex. HNHM.

Remarks: This species was described in detail (Medvedev 2007) from south-western Yunnan (Baoshan), and I have no doubts that the above listed series from the closely adjacent north-eastern Burma belongs to the same species. *M. belousovi* is similar to *M. wittmeri* and *M. gairibansicus* n. sp., both from India, in body shape and size, irregular elytral punctation, and in similar antennae with a 3-segmented antennal club. However, in *M. belousovi* all 3 antennomeres 8–10 of the club are separated, whereas in both Indian species the terminal antennomeres 9–10 are fused. For aedeagi see Figs. 6, 8, 10.

Distribution: SW Yunnan and adjacent NE Burma (Myanmar), so far unknown in India.

Menimus caraboides (Allard, 1894)
(Figs. 4, 7)

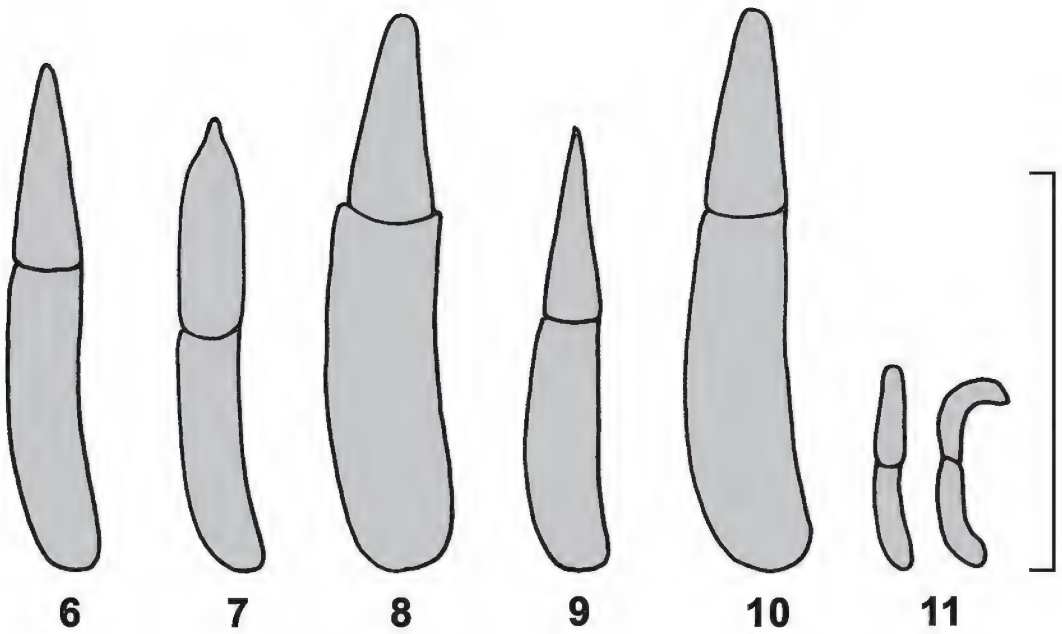
Chariotheca caraboides Allard, 1894.

Examined type specimens: India, Maduré (= Madurai), without further data, 2 syntypes MNHN (coll. Allard), 1 ♂ designated herewith as lectotype.

Examined material: India, Madras, Kodaikanal, 2100 m, 11.XI.1972, leg. C. Besuchet, I. Löbl, R. Mussard, 5 ex. HNHM, 1 ex. SMNS.

Remarks: Unfortunately, both types are in bad condition, and distal parts of all antennae are missing. Without dissection of the male genitalia, alone by body size and shape, and by dorsal punctation, this species is difficult to distinguish from *M. ovalis*. The available specimens of *M. caraboides* are slightly larger, and the lateral margins of the pronotum are somewhat rounded, but straight conical in *M. ovalis* (Allard, 1894). However, the shapes of the aedeagal apicales are quite different (Figs. 7, 9).

Distribution: South India (Tamil Nadu).



Figs. 6–11. *Menimus* spp., aedeagi. – **6**. *M. belousovi*, ♂ non-type Burma, SMNS. **7**. *M. caraboides*, ♂ lectotype MNHN. **8**. *M. gairibansicus* n. sp., ♂ holotype SMNS. **9**. *M. ovalis*, ♂ lectotype MNHN. **10**. *M. wittmeri*, ♂ paratype SMNS. **11**. *M. hunlicus* n. sp., dorsal view left, lateral view right, ♂ holotype ZFMK. – Scale: 1 mm.

Menimus ovalis (Allard, 1894)
(Figs. 3, 9)

Chariotheca ovalis Allard, 1894.
Menimus indicus Gebien, 1925 **n. syn.**

Examined type specimens: India, Maduré (= Madurai), without further data, 4 syntypes of *Chariotheca ovalis* MNHN (coll. Allard), 1 ♂ designated herewith as lectotype. – India, Madras (= Chennai), ♂ holotype of *Menimus indicus* NHMB (coll. Frey).

Examined material: India, Madras, without further data, 2 ex. SMNS. – India, Madurai, Shembagamur, without further data, 4 ex. SMNS, 3 ex. HNHM. – India, Tamil Nadu, Ootakamund, 2100 m, 20.–21.VIII.1989, leg. A. Riedel, 25 ex. SMNS. – India, Tamil Nadu, Kodaikanal, Munnar, 2300 m, 26.–27.VIII.1989, leg. A. Riedel, 4 ex. SMNS. – India, Madras, Kodaikanal, 1750–2300 m, 11.–13.XI.1972, leg. C. Besuchet, I. Löbl, R. Mussard, 3 ex. HNHM. – India, Madras, Berijam Lake, 2150 m, 14.XI.1972, leg. C. Besuchet, I. Löbl, R. Mussard, 1 ex. HNHM.

Synonymy: Gebien (1925), when describing *M. indicus*, did not study Allard's types. The holotype of *M. indicus* shows no specific differences to the type series of *C. ovalis*, including shape of aedeagus, thus both names represent the same species with *M. indicus* as a junior synonym.

Distribution: South India (Tamil Nadu).

Menimus wittmeri Kaszab, 1982
(Fig. 10)

Examined type specimens: India, Sikkim, Dzongri, 3000 m, 17.X.1977, leg. B. Bhakta, holotype and 10 paratypes NHMB, 8 paratypes HNHM, 4 paratypes SMNS.

Remarks: Treated and figured by Schawaller (2009), aedeagus firstly figured herein (Fig. 10).

Distribution: North India (Sikkim).

4 Key to the species of *Menimus* from India and adjacent Burma

1 Last 3 antennomeres (8–10) forming separate club, complete elytra with irregular punctation, and without traces of punctural rows..... **2**
– Last 4–5 antennomeres (6 or 7–10 forming separate club, at least elytral disc with irregular punctural rows. **4**

2 Last 3 antennomeres (8–10) separated and not fused, one species from Yunnan and adjacent Burma. – Figs. 1, 6..... ***M. belousovi***
– Last 2 antennomeres (9–10) fused, two species from northeastern India..... **3**

3 Pronotum widest at base, with lateral margins parallel in basal part. – Aedeagus as in Fig. 10; dorsal view see Schawaller (2009: pl. XIV, fig. e). ..... ***M. wittmeri***
– Pronotum widest before base, lateral margins rounded in basal part. – Figs. 2, 8..... ***M. gairibansicus* n. sp.**

4 Body length less than 4 mm, body elongate parallel, last 4 antennomeres 7–10 forming a separate club, one species from northern India. – Figs. 5, 11..... ***M. hunlicus* n. sp.**
– Body length around 5 mm, body ovate, last 5 antennomeres (6–10) forming a separate club, two similar species from southern India..... **5**

5 Pronotum with somewhat rounded lateral margins, apicale of aedeagus broad with laterally excavated tip. – Figs. 4, 7.... ***M. caraboides***
– Pronotum with straight conical lateral margins, apicale of aedeagus narrow triangular with acute tip. – Figs. 3, 9..... ***M. ovalis***

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Leiochrinini (Coleoptera: Tenebrionidae: Diaperinae) from north-eastern India and China, with descriptions of six new species[1]

Wolfgang Schawaller

Abstract

Newly collected specimens of the tenebrionid tribe Leiochrinini Lewis, 1894 (Diaperinae Latreille, 1802) from continental China and north-eastern India are treated in the present paper, including several new geographical records and six new species: *Derispia arunachala* **n. sp.** and *Derispia bomdila* **n. sp.** from Arunachal Pradesh, *Derispia hajeki* **n. sp.** and *Derispia heishidinga* **n. sp.** from Guangdong and Guangxi, as well as *Derispia shillonga* **n. sp.** and *Leiochrinus metallicus* **n. sp.** from Meghalaya.

Keywords: Coleoptera, Tenebrionidae, Leiochrinini, taxonomy, new species, new records, distribution, India, China.

Zusammenfassung

Neu gesammelte Exemplare der Tenebrioniden-Tribus Leiochrinini Lewis, 1894 (Diaperinae Latreille, 1802) aus dem kontinentalen China und Nordost-Indien werden in vorliegender Arbeit behandelt, einschließlich zahlreicher neuer geografischer Nachweise und sechs neuer Arten: *Derispia arunachala* **n. sp.** und *Derispia bomdila* **n. sp.** aus Arunachal Pradesh, *Derispia hajeki* **n. sp.** und *Derispia heishidinga* **n. sp.** aus Guangdong und Guangxi, sowie *Derispia shillonga* **n. sp.** und *Leiochrinus metallicus* **n. sp.** aus Meghalaya.

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1 Introduction

The tenebrionid tribe Leiochrinini Lewis, 1894 (Diaperinae Latreille, 1802) is a relatively uniform tribe, with the body shape and often with a colour pattern to be observed in coccinellids. The species occur mostly in the south-eastern Palaearctic, Oriental and Papuan regions, a few species live in the African tropics and in Madagascar; they are completely lacking in the Neotropics. Kaszab (1946) presented a monograph of this group, subsequently he summarised new records and species for the described 11 genera (Kaszab 1954, 1961a–c, 1975, 1979, 1980). Grimm (2013), Schawaller (1992, 1993, 1998, 2005, 2011) and Yang & Ren (2011) added supplements to certain Oriental regions.

Newly collected specimens from continental China and north-eastern India are treated in the present paper, including several new geographical records and six new species. North-eastern India (except Sikkim and Darjeeling) was so far only little covered by the cited contributions, although it is of particular zoogeographical interest. This area in the Indian provinces Arunachal Pradesh and Meghalaya lies quite remote and was restricted for travellers since a long time due to political troubles. These restrictions are somewhat relaxed in the last years, so that a larger number of newly collected species and specimens from that area become available recently.

Ades Guérin-Méneville, 1857 (type species *hemisphericus* Guérin-Méneville, 1857 from Madagascar) is the older name for *Leiochrodes* Westwood, 1883 (type species *discoidalis* Westwood, 1883 from the Oriental region). However, it seems not yet clear, if both genus names are really synonymous. I prefer to use *Ades* only for the few African species, and *Leiochrodes* for the bulk of Oriental species (as Kaszab did in his monograph and subsequent papers).

Leiochrinini species are restricted to humid habitats. Both adults and larvae occur in soil litter, in rotten wood, on or under barks, feeding very probably on mosses and algae.

[1] Contributions to Tenebrionidae, no. 135. – For no. 134 see: Stuttgarter Beiträge zur Naturkunde A, Neue Serie 9 (2016).

Acronyms of depositories

CRG	Collection Dr. ROLAND GRIMM, Neuenbürg, Germany
NHMB	Naturhistorisches Museum, Basel, Switzerland
NME	Naturkundemuseum, Erfurt, Germany
NMPC	National Museum (Natural History), Prague, Czech Republic
SMNS	Staatliches Museum für Naturkunde, Stuttgart, Germany
ZFMK	Zoologisches Forschungsinstitut A. Koenig, Bonn, Germany

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For the loan of specimens from the collections under their care I thank Dr. DIRK AHRENS (Bonn), Dr. JIRI HÁJEK (Prague), MATTHIAS HARTMANN (Erfurt), and Dr. EVA SPRECHER-ÜBERSAX (Basel). The photographs were taken by JOHANNES REIBNITZ (Stuttgart) with a Leica DFC320 digital camera on a Leica MZ16 APO microscope and subsequently processed by him with Auto-Montage (Syncroscopy) software. The referees Dr. ROLAND GRIMM (Neuenbürg) and Dr. OTTÓ MERKL (Budapest) kindly improved the manuscript by their comments.

2 New species

Derispia arunachala **n. sp.**
(Figs. 1, 10)

Holotype (♂): NE India, Arunachal Pradesh, W Bomdila, 2600 m, 17.V.2004, leg. L. DEMBICKÝ, NHMB.

Paratypes: Same data as holotype, 4 ex. NHMB, 2 ex. SMNS.

Etymology: Named after the Indian province Arunachal Pradesh, where the type series was collected.

Description: Body length 2.7–3.0 mm. Dorsal side (Fig. 1) shining, with head and pronotum light brownish, and with blackish elytra with yellowish colour pattern (anterior spot not connected with shoulders, broad posterior transverse band interrupted at suture and connected with lateral margin from shoulders until tip); antennae unicoloured yellowish; ventral side brownish. Head with a few, very fine punctures similar as on pronotum. Third antennomere short, about 1.5 times as long as antennomere 2. Pronotum widest at base, lateral margins and anterior corners rounded; basal margin unbordered; prosternal apophysis not prominent. Metaventrite and abdominal ventrites shining and with a few sparse and fine punctures, last ventrite unbordered. Elytra round, flat convex, lateral margin visible in dorsal view from shoulders nearly to apex; surface shining with irregular rows of distinct punctures without striae, all intervals flat and with similar distinct punctures as in rows; epipleura without punctures. Legs without modifications. Aedeagus with thick and bent basale and with apicale spade-like at tip (Fig. 10).

Diagnosis: *Derispia arunachala* n. sp. runs in the key of KASZAB (1961a) to *D. kraatzi* Kaszab, 1946 from Burma and China (see below), and both share the small body size, the dense and distinct punctation in the elytral rows and intervals, and the flat elytra. However, in *D. kraatzi* the elytra are ovate and the elytral spots are darker red, and the aedeagus is distinctly different (KASZAB 1946: figs. 139, 140). See also under *Derispia heishidinga* n. sp. from Guangdong (Figs. 4, 8). Further similar small and flat species are unknown to the author.

Derispia bomdila **n. sp.**
(Figs. 3, 12)

Holotype (♂): NE India, Arunachal Pradesh, W Bomdila, 2600 m, 17.V.2004, leg. L. DEMBICKÝ, NHMB.

Paratypes: Same data as holotype, 2 ex. NHMB. – NE India, Arunachal Pradesh, between Dirang and Bomdila Pass, 2200 m, 15.VI.2004, leg. L. DEMBICKÝ, 7 ex. NHMB, 4 ex. SMNS.

Etymology: Named after the locality Bomdila, in whose vicinity the type series was collected.

Description: Body length 3.3–3.8 mm. Dorsal side (Fig. 3) shining, with head, pronotum and legs completely yellowish, and with blackish elytra with five similar yellowish spots and with yellowish lateral margins from shoulders until tip; antennae darker towards tip; ventral side brownish. Head with a few fine punctures similar as on pronotum. Third antennomere long, 2 times as long as antennomere 2. Pronotum widest at base, lateral margins and anterior corners rounded; basal margin unbordered; prosternal apophysis not prominent. Metaventrite and abdominal ventrites shining and with a few sparse and fine punctures, last ventrite unbordered. Elytra round, high convex, lateral margin visible in dorsal view from shoulders nearly to apex; surface shining with regular rows of fine punctures without striae, punctures laterally somewhat larger than medially along suture, all intervals flat and with a few sparse fine punctures, lateral intervals without denser punctation; epipleura without punctures. Legs without modifications. Aedeagus with broad apicale truncate at tip (Fig. 12).

Diagnosis: *Derispia bomdila* n. sp. has a similar size, body shape and elytral coulour pattern as *D. similis* Kaszab, 1961 from Yunnan, and *D. dembickyi* Schawaller, 2005, from Thailand and Vietnam. However, the aedeagi of these species are quite different with longer narrow apicale with rounded tip in *similis* (KASZAB 1961a: figs. 28, 29), or with shorter broad apicale with rounded tip in *dembickyi* (SCHAWALLER 2005: figs. 32, 33). Additionally, the lateral elytral rows are distinctly (*similis*) or slightly (*dembickyi*) irregular and the lateral intervals with distinctly denser (*similis*) or slightly denser (*dembickyi*) punctation. The third antennomere is also shorter in both species and only 1–1.3 times as long as antennomere 2.

Derispia hajeki **n. sp.**
(Figs. 5, 9)

Holotype (♂): China, Guangdong Prov., W Qixing, Heishiding NR, 190 m, 1.–3.V.2011, leg. M. Fikáček & J. Hájek, NMPC.

Paratypes: Same data as holotype, 1 ex. NMPC, 1 ex. SMNS. – China, Guangxi, Miaoershan, south slope, 800–1300 m, 20.–27.VI.1997, leg. L. Bolm, 1 ex. NHMB, 1 ex. SMNS.

Etymology: Named in honour of Jiri Hájek (Prague), one of the collctors of the type series, and curator of Coleoptera in Prague, who entrusted me since years with the loan of tenebrionids for study.

Description: Body length 2.0–2.3 mm. Dorsal side (Fig. 5) shining, head and pronotum brownish, and with black elytra with yellowish colour pattern (long oval yellowish ring at disc, and lateral parts of elytra yellowish to a different extent); antennae yellowish with darkened distal antennomeres; ventral side brownish. Head with a few, very fine punctures similar as on pronotum. Third antennomere short, about 1.5 times as long as antennomere 2. Pronotum widest at base, lateral margins and anterior corners rounded; basal margin unbordered; prosternal apophysis not prominent. Metaventrite and abdominal ventrites shining and with a few sparse and fine punctures, last ventrite unbordered. Elytra round, highly convex, lateral margin visible in dorsal view only in anterior third; surface shining with regular rows of very fine punctures without striae, punctures of lateral rows somewhat larger than of internal rows, all intervals flat and without punctures; epipleura without punctures. Legs without modifications. Aedeagus with bent basale and with broad parallel apicale rounded at tip (Fig. 9).

Diagnosis: *Derispia hajeki* n. sp. is most simlar to *Derispia cooteri* Schawaller, 2005 from Jiangxi, sharing the small body size, the high convex elytra with the lateral margin visible in dorsal view only near the shoulders, a similar colour pattern of the elytra, and the fine punctural elytral rows. However, *D. cooteri* is slightly larger (2.5–3.0 mm), the lateral elytral intervals bear a fine punctation, and the aedeagus is different with a narrow longer apicale. *Derispia lineolata* (Pic, 1922) from China, partly from the same locality Miaoershan (see below), has also a similar colour pattern of the elytra, but the elytra are flat convex, the elytral intervals are with distinct punctation, and the aedeagus is also different.

Derispia heishidinga **n. sp.**
(Figs. 4, 8)

Holotype (♂): China, Guangdong Prov., W Qixing, Heishiding NR, 190 m, 1.–3.V.2011, leg. M. Fikáček & J. Hájek, NMPC.

Paratype: Same data as holotype, 1 ex. SMNS.

Etymology: Named after the Heishiding Nature Reserve, where the type series was collected.

Description: Body length 2.5–2.8 mm. Dorsal side (Fig. 4) shining, brownish, and with brownish elytra with black spots (one spot at base near shoulders, one at suture behind scutellum and one at suture behind middle, one in middle of disc, and one laterally in posterior part reaching tip); antennae yellowish with darkened distal antennomeres; ventral side brownish. Head with a few, very fine punctures similar as on pronotum. Third antennomere short, about 1.5 times as long as antennomere 2. Pronotum widest at base, lateral margins and anterior corners rounded; basal margin unbordered; prosternal apophysis not prominent. Metaventrite and abdominal ventrites shining and with a few sparse and fine punctures, last ventrite unbordered. Elytra round, flat convex, lateral margin visible in dorsal view from shoulders nearly to apex; surface shining with irregular rows of distinct punctures without striae, all intervals flat and with similar distinct punctures as in rows; epipleura without punctures. Legs without modifications. Aedeagus with bent basale and with broad parallel apicale rounded at tip (Fig. 8).

Diagnosis: *Derispia heishidinga* n. sp. runs in the key of Kaszab (1961a) to *D. bisquinquemaculata* Blair, 1937 and *D. bistrimaculata* Blair 1937, both from north-eastern India, and belongs to the small group of species with small body size below 3 mm, with dense and distinct punctation in the elytral rows and intervals, and with flat elytra. It can be recognised by the specific dorsal colour pattern (elytra brownish with indistinct black spots) in combination with the shape of the aedeagus. *Derispia sichuanensis* Schawaller, 1993 from Sichuan and *Derispia arunachala* n. sp. from north-eastern India share the small body size, flat elytra and distinct elytral punctation, but the dorsal colour pattern and shape of aedeagus are completely different. The other species of this group are higher convex and have lighter yellowish elytra with distinct black spots, and also different aedeagi.

Derispia shillonga **n. sp.**
(Figs. 2, 11)

Holotype (♂): NE India, Meghalaya, Khasi Hills region, Shillong peak, 1850 m, 4.–5.VI.1996, leg. E. Jendek & O. Šauša, NMPC.

Paratypes: Same data as holotype, 3 ex. NMPC, 2 ex. SMNS.

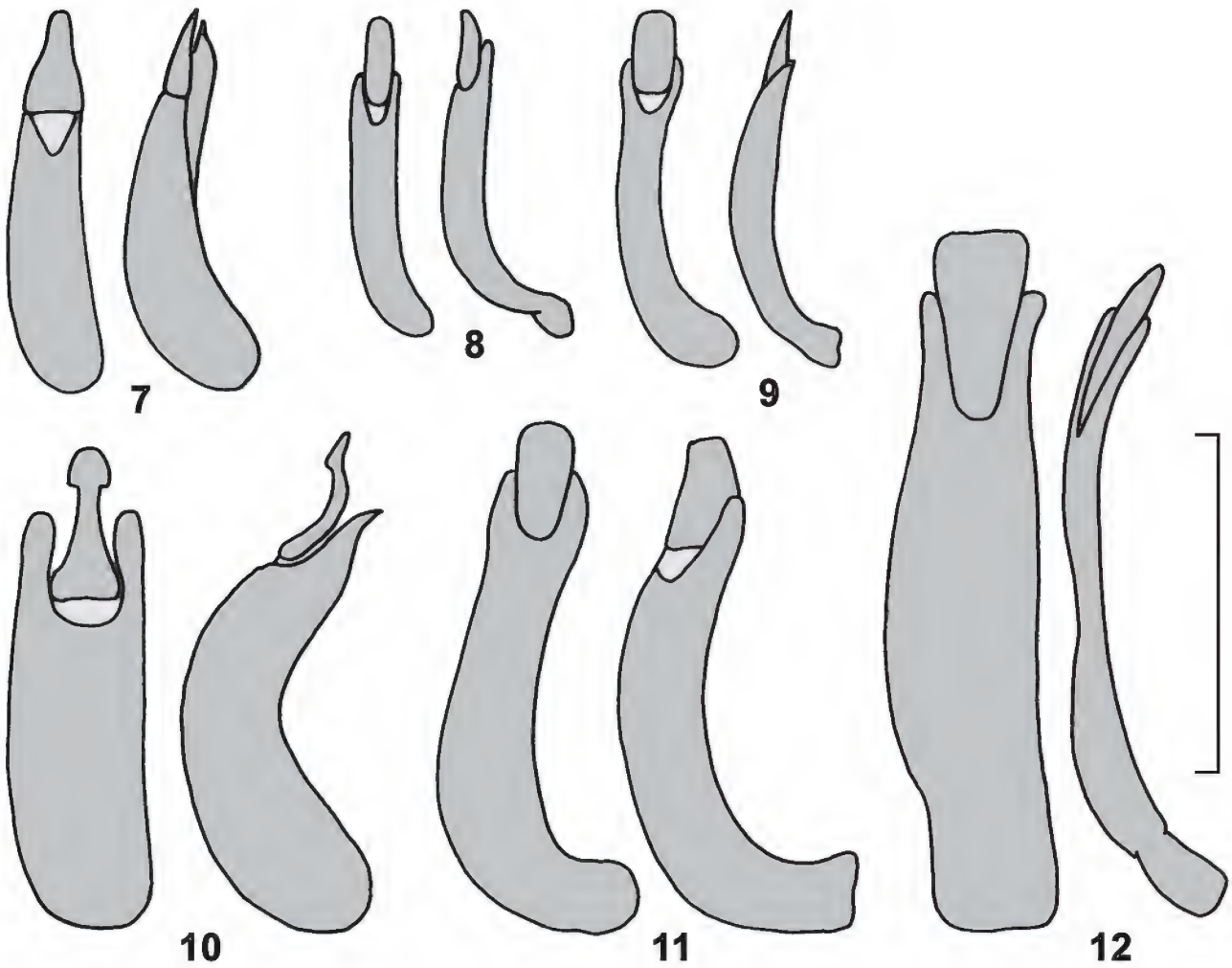
Etymology: Named after the mountain Shillong, where the type series was collected.

Description: Body length 3.3–3.5 mm. Dorsal side (Fig. 2) shining, with head and pronotum dark brownish, and with blackish elytra with yellowish colour pattern (round spot besides scutellum, anterior narrow transverse zigzag band connected with shoulders, smaller connected

Figs. 1–6. Dorsal view of Leiochrinini. – **1**. *Derispia arunachala* n. sp., ♂ holotype NHMB. **2**. *Derispia shillonga* n. sp., ♂ holotype NMPC. **3**. *Derispia bomdila* n. sp., ♂ holotype NHMB. **4**. *Derispia heishidinga* n. sp., ♂ holotype NMPC. **5**. *Derispia hajeki* n. sp., ♂ holotype NMPC. **6**. *Leiochrinus metallicus* n. sp., ♂ holotype SMNS. – Scale: 2 mm.

spots on disc and near tip); antennae darker towards tip; ventral side brownish. Head with a few, very fine punctures similar as on pronotum. Third antennomere short, about 1.3 times as long as antennomere 2. Pronotum widest at base, lateral margins and anterior corners rounded; basal margin unbordered; prosternal apophysis not prominent. Metaventrite and abdominal ventrites shining and with a few sparse and fine punctures, last ventrite unbordered. Elytra round, flat convex, lateral margin visible in dorsal view from shoulders nearly to apex; surface shining with rows of distinct punctures without striae, lateral rows irregular, all intervals flat and with similar distinct punctures as in rows, lateral intervals with denser punctation; epipleura without punctures. Legs without modifications. Aedeagus with distinctly bent basale and with broad apicale rounded at tip (Fig. 11).

Diagnosis: *Derispia shillonga* n. sp. has a similar colour pattern as the species group around *D. hobbyi* Kaszab, 1946, *D. korschefskyi* Kaszab, 1946, both from Assam, and *D. confluens* Kaszab, 1946 from north-eastern India and Nepal, but can be separated from these by a flatter convex body. *D. hobbyi* is slightly larger (4.0–4.7 mm), the body is high convex and the elytral lateral margin only visible in anterior third, and the aedeagus is different (Kaszab 1946: figs. 170, 181). *D. korschefskyi* is also somewhat larger (3.8–4.0 mm), high convex, the lateral parts of elytra have a denser irregular punctation, and the aedeagus is different (Kaszab 1946: figs. 124, 143). Most similar concerning colour pattern, dorsal punctation, and even shape of aedeagus is *D. confluens*, but this species is also larger (4.2–4.9 mm), and high convex (Kaszab 1946: figs. 165, 166, 183).



Figs. 7–12. Dorsal (left) and lateral (right) view of aedeagus. – **7**. *Leiochrinus metallicus* n. sp., ♂ holotype SMNS. **8**. *Derispia heishidinga* n. sp., ♂ holotype NMPC. **9**. *Derispia hajeki* n. sp., ♂ holotype NMPC. **10**. *Derispia arunachala* n. sp., ♂ holotype NHMB. **11**. *Derispia shillonga* n. sp., ♂ holotype NMPC. **12**. *Derispia bomdila* n. sp., ♂ holotype NHMB. – Scale: 1 mm.

Leiochrinus metallicus **n. sp.**
(Figs. 6, 7)

Holotype (♂): NE India, Meghalaya, 3 km E Tura, 1150 m, 6.–12.V.2002, leg. M. Trýzna & P. Benda, SMNS.

Paratypes: Same data as holotype, 3 ex. SMNS.

Etymology: Named after the distinct metallic dorsal surface, unique within the genus.

Description: Body length 4.5–4.8 mm. Dorsal side (Fig. 6) shining, with distinct blue-metallic lustre, only anterior corners of pronotum light, legs and antennae dark ferruginous, ventral side blackish. Head covered by pronotum until antennal insertions, visible anterior part with a few tiny, nearly unvisible punctures, clypeus straight, between clypeus and genae without incision. Third antennomere 4 times as long as wide, antennomeres 5–11 broader. Pronotum widest at base, lateral margins rounded, anterior margin with semi-circular excavation, anterior corners rounded, posterior corners rectangular; surface shining, without punctation; all margins with fine border except anterior margin in middle; prosternal apophysis not prominent. Metaventrite and abdominal ventrites shining and unpunctured, last ventrite unbordered. Elytra round, flat convex, lateral margin visible in dorsal view from shoulders nearly to apex; surface shining without punctures; epipleura without punctures. Legs without modifications, tarsomeres prolonged as characteristic for the genus. Aedeagus with triangular apicale rounded at tip (Fig. 7).

Diagnosis: *Leiochrinus metallicus* n. sp. is quite similar to *L. sauteri* Kaszab, 1946 from the same area, and has also the pronotum with distinct anterior excavation, and a similar aedeagus (compare Kaszab 1946: fig. 215). However, *L. metallicus* n. sp. has a distinct metallic dorsal surface, whereas *L. sauteri* is always light or dark ferrugineous, but never with such a distinct metallic lustre. At present, I consider this difference as specific.

3 New records of known species

Crypsis bimaculatus Kaszab, 1946

Material: NE India, Arunachal Pradesh, Etalin, 700 m, 12.–25.V.2012, leg. L. Dembický, 12 ex. ZFMK, 1 ex. SMNS.

Distribution: NE India (type locality), E Nepal (Schawaller 2011).

Crypsis chinensis Kaszab, 1946

Material: China, Guangxi, Longsheng Hot Spring, 360 m, 11.–14.IV.2013, leg. M. Fikáček, J. Hájek & J. Růžička, 7 ex. NMPC, 1 ex. SMNS. – China, Guangdong, Nanling NR, Dadongshan, 690 m, 18.–21.IV.2013, leg. J. Hájek & J. Růžička, 3 ex. NMPC.

Distribution: China, Fujian (type locality), Sichuan, Guangxi, Zhejiang (Schawaller 2011), Guangdong (new record).

Derispia bisquadrimaculata Kaszab, 1961

Material: China, Guangxi, Shiwandashan Forest Park, 290–360 m, 5.–9.IV.2013, leg. M. Fikáček, J. Hájek & J. Růžička, 1 ex. NMPC, 1 ex. SMNS.

Distribution: Indochina (type locality), China/Guangxi (new record).

Derispia confluens Kaszab, 1946

Material: NE India, Arunachal Pradesh, Hunli, 1200–1400 m, 26.V.–1.VI.2012, leg. L. Dembický, 3 ex. ZFMK.

Distribution: NE India (type locality) (Kaszab 1946), Nepal (Schawaller 1992).

Derispia indica Kaszab, 1946

Material: NE India, Meghalaya, Khasi Hills, 11 km SW Cherrapunjee, 735 m, 25.IV.2008, leg. M. Fikáček, H. Podskalská & P. Šipek, 1 ex. NMPC.

Distribution: NE India (type locality), Burma (Kaszab 1961a), Nepal (Kaszab 1970), Bhutan (Kaszab 1975).

Derispia jizushanica Schawaller, 2005

Material: China, Yunnan, Baoshan Pref., Gaoligong Shan, 33 km SE Tengchong, 2100–2200 m, 31.V.2007, leg. A. Pütz, 1 ex. SMNS. – China, Yunnan, Baoshan Pref., Gaoligong Shan, 29 km ESE Tengchong, 2350 m, 1.VI.2007, leg. D. Wrase, 1 ex. SMNS.

Distribution: China/Yunnan (type locality).

Derispia kraatzi Kaszab, 1946

Material: China, Guangxi, Longsheng Hot Spring, 360 m, 11.–14.IV.2013, leg. M. Fikáček, J. Hájek & J. Růžička, 1 ex. SMNS.

Distribution: Burma (type locality), China/Guangxi (new record).

Derispia lineolata (Pic, 1922)

Material: China, Guangxi, Miaoershan, south slope, 800–1300 m, 20.–27.VI.1997, leg. L. Bolm, 1 ex. SMNS. – China, Jiangxi, Jinggang Shan, Xiping, 915 m, leg. M. Fikáček & J. Hájek, 1 ex. NMPC.

Distribution: Vietnam; China, Fujian (type locality), Sichuan, Hunan (Schawaller 2005), Guangxi, Jiangxi (new records).

Derispia maculipennis (Marseul, 1874)

Material: China, Zhejiang, Anji County, Long Wang Shan NR, 1000 m, 11.–14.V.1996, leg. J. Cooter, 1 ex. SMNS. – China, Shaanxi, Zhongchuan, 3.–5.VI.2005, leg. E. Kučera, 1 ex. SMNS. – China, Guangxi, Longsheng Hot Spring, 360 m, 11.–14.IV.2013, leg. M. Fikáček, J. Hájek & J. Růžička, 50 ex. NMPC, 2 ex. SMNS. – China, Guizhou, 60 km N Kaili, Shibing-Yuntalshan, 21.–26.V.1995, leg. O. Šauša & E. Jendek, 1 ex. NMPC. – China, Hunan, 30 km N Dayong, Yanjiajie, 27.–29.V.2005, leg. O. Nakládal, 1 ex. NMPC.

Distribution: Japan (type locality); China: Fujian, Sichuan, Shaanxi, Guangxi, Hunan (Schawaller 1993, 2005); Guizhou, Zhejiang (new records).

Derispia notata Kaszab, 1946

Material: Bhutan, Gaylegphug Prov., Gaylegphug, 250 m, 7.–10.VIII.1990, leg. C. Holzschuh, 2 ex. NME, 2 ex. SMNS.

Distribution: "Vorderindien" (Kaszab 1946); Nepal, Thailand (Schawaller 1992, 2005); Bhutan (new record).

Derispia sichuanensis Schawaller, 1993

Material: China, Guizhou, 60 km N Kaili, Shibing-Yuntalshan, 21.–26.V.1995, leg. O. Šauša & E. Jendek, 1 ex. NMPC.

Distribution: China, Sichuan (type locality), Guizhou (new record).

Derispia similis Kaszab, 1961

Material: China, Yunnan, Xinjie, 1250–1500 m, 24.VI.1994, leg. V. Kubáň, 1 ex. SMNS. – China, Yunnan, Baoshan Pref., Gaoligong Shan, 33 km SE Tengchong, 2100–2200 m, 31.V.–4.VI.2007, leg. D. Wrase, 1 ex. SMNS. – China, Guangdong, 30 km NE Shaoguan, Duanshi, Danxia Shan NP, 125 m, 4.–5.V.2011, leg. J. Hájek, 1 ex. NMPC.

Distribution: China, Yunnan (Kaszab 1961a), Guangdong (new record).

Derispia titschaki Kaszab, 1946

Material: China, Hongkong, 28.VII.1985, leg. K. Masumoto, 3 ex. SMNS. – China, Guangdong, Danxia Shan NP, Wo Long Gang Forest, 100 m, 23.–26.IV.1013, leg. J. Hájek & J. Růžička, 2 ex. NMPC, 1 ex. SMNS.

Distribution: China, Canton, Shanghai (type locality), Hongkong; W Malaysia (Schawaller 2005), E Malaysia (Grimm 2010).

Derispia tricolor Kaszab, 1942

Material: China, Jiangxi, Jinggang Shan, Zhufeng, 805 m, 29.IV.2011, leg. M. Fikáček & J. Hájek, 6 ex. NMPC, 2 ex. SMNS.

Distribution: China, Fujian (type locality), Guangxi (Schawaller 2005), Jiangxi (new record).

Derispia walkeri Kaszab, 1961

Material: China, Hongkong, 24.X.1984, leg. K. Masumoto, 5 ex. SMNS. – China, Hongkong, Lantau Isl., Ngong Ping, Po Lin Monastery, 480–590 m, 26.–28.VI.2007, leg. J. Hájek & J. Růžička, 4 ex. NMPC, 1 ex. SMNS.

Distribution: China, Hongkong (type locality) (Kaszab 1961a).

Derispiella hingstoni Kaszab, 1961

Material: NE India, Arunachal Pradesh, Hunli, 1200–1400 m, 26.V.–1.VI.2012, leg. L. Dembický, 2 ex. ZFMK, 1 ex. SMNS.

Remarks: According to Kaszab (1961c), the genus *Derispiella* Kaszab, 1961 differs from *Derispiola* Kaszab, 1946 only by the broadened first tarsomere in males, and by only weak male characters on the head. Later, Kaszab (1975) transferred *Derispiola blairi* Kaszab, 1946 (see below) to *Derispiella*, and described a further species from Bhutan, *Derispiella bhutanensis* Kaszab, 1975. Very probably, according to the description, *Derispiella bhutanensis* is a synonym of *Derispiella hingstoni* from Darjeeling. A detailed revision of this group might even reveal that *Derispiella* is a synonym of *Derispiola*.

Distribution: NE India (type locality) (Kaszab 1961c), Bhutan (Kaszab 1975).

Derispiella blairi (Kaszab, 1946)

Material: NE India, Arunachal Pradesh, Etalin, 700 m, 12.–25.V.2012, leg. L. Dembický, 12 ex. ZFMK, 2 ex. SMNS. – NE India, Arunachal Pradesh, Hunli, 1200–1400 m, 26.V.–1.VI.2012, leg. L. Dembický, 3 ex. ZFMK.

Remarks: Kaszab (1946) described this species in the genus *Derispiola*, then (Kaszab 1975) transferred it to *Derispiella* (see above under *Derispiella hingstoni*).

Distribution: NE India (type locality), Nepal, Indochina, China/Yunnan (Schawaller 2005); Bhutan (Kaszab 1975).

Derispiola darjeelingiana Kaszab, 1946

Material: NE India, Sikkim, Mangan, 3500 m, 24.–27.V.2002, leg. M. Trýzna & P. Benda, 1 ex. SMNS. – NE India,

Meghalaya, 1 km E Tura, 500–600 m, 2.–5.V.2002, leg. M. Trýzna & P. Benda, 2 ex. SMNS. – NE India, Meghalaya, 3 km E Tura, 1150 m, 6.–12.V.2002, leg. M. Trýzna & P. Benda, 3 ex. SMNS.

Distribution: NE India (type locality Sikkim), Nepal (Schawaller 1992).

Derispiola fruhstorferi Kaszab, 1946

Material: NE India, Meghalaya, Khasi Hills, 1800–1900 m, 4.–5.VI.1996, leg. E. Jendek & O. Šauša, 2 ex. NMPC.

Distribution: Indochina (type locality), Thailand, China/Sichuan (Schawaller 2005); NE India (new record).

Derispiola unicornis Kaszab, 1946

Material: China, Guangxi, Longsheng Hot Spring, 360 m, 11.–14.IV.2013, leg. M. Fikáček, J. Hájek & J. Růžička, 55 ex. NMPC, 3 ex. SMNS.

Distribution: China, Fujian (type locality), Sichuan, Guizhou, Guangxi, Hunan, Hubei; Laos (Schawaller 2005).

Leiochrinus sauteri Kaszab, 1946

Material: NE India, Arunachal Pradesh, Etalin, 700 m, 12.–25.V.2012, leg. L. Dembický, 7 ex. ZFMK. – NE India, Arunachal Pradesh, Hunli, 1200–1400 m, 26.V.–1.VI.2012, leg. L. Dembický, 7 ex. ZFMK.

Distribution: Himalayas, Indochina, Taiwan, China/Guizhou (Schawaller 2005).

Leiochrinus satsumae Lewis, 1894

Material: NE India, Arunachal Pradesh, Etalin, 700 m, 12.–25.V.2012, leg. L. Dembický, 3 ex. ZFMK, 1 ex. SMNS. – NE India, Arunachal Pradesh, Hunli, 1200–1400 m, 26.V.–1.VI.2012, leg. L. Dembický, 11 ex. ZFMK.

Distribution: Indochina, Japan (type locality) (Kaszab 1946); NE India, Thailand (Schawaller 1993).

Leiochrodes assimilis Kaszab, 1961

Material: NE India, Arunachal Pradesh, Etalin, 700 m, 12.–25.V.2012, leg. L. Dembický, 3 ex. ZFMK. – NE India, Arunachal Pradesh, Hunli, 1200–1400 m, 26.V.–1.VI.2012, leg. L. Dembický, 2 ex. ZFMK. – NE India, Meghalaya, 3 km E Tura, 1150 m, 6.–12.V.2002, leg. M. Trýzna & P. Benda, 4 ex. SMNS. – NE India, Meghalaya, 1 km E Tura, 500–600 m, 10.–15.VI.2002, leg. M. Trýzna & P. Benda, 2 ex. SMNS.

Distribution: NE India (type locality Sikkim) (Kaszab 1961b), Nepal (Schawaller 1992).

Leiochrodes diaphanus (Fabricius, 1798)

Material: Laos, Phongsaly Prov., Phongsaly, 1500 m, 6.–17.V.2004, leg. M. Brancucci, 1 ex. NHMB. – China, Guangdong, Danxia Shan NP, 30 km NE Shaoguan, Duanshi, 125 m, 4.–5.V.2011, leg. J. Hájek, 1 ex. NMPC.

Remarks: Similar to *Leiochrodes formosanus* Kaszab, 1946, known from Taiwan and Sichuan (Schawaller 1993), but with different aedeagus (compare Kaszab 1946).

Distribution: Sri Lanka, India (type locality); Nepal (Kaszab 1970, Schawaller 1993); Laos, China/Guangdong (new records).

Leiochrodes discoidalis Westwood, 1883

Material: NE India, Assam, Kohora (= Kaziranga), 160 m, 16.–18.IV.2008, leg. M. Fikáček, H. Podskalská & P. Šipek, 1 ex. NMPC. – China, S Yunnan, Xishuangbanna, 20 km NW Jinghong, Man Dian, 720 m, 26.V.2008, leg. A. Weigel, 1 ex. CRG, 1 ex NME.

Distribution: Sunda Islands, Malaysia (Kaszab 1961b); China/Yunnan (new record); NE India, Thailand, Laos (unpublished records SMNS).

Leiochrodes glabratus (Walker, 1859)

Material: NE India, Arunachal Pradesh, Etalin, 700 m, 12.–25.V.2012, leg. L. Dembický, 1 ex. ZFMK. – China, Hainan Island, Limushan Mts, 550–750 m, 5.V.2011, leg. M. Fikáček & Zhao, 2 ex. NMPC. – China, Guangdong, Danxia Shan NP, Wo Long Gang Forest, 100 m, 23.–26.IV.2013, leg. J. Hájek & J. Růžička, 1 ex. NMPC.

Distribution: Widely distributed in the Oriental region, also in Taiwan, NE India, China/Fujian (Kaszab 1946); Bhutan (Kaszab 1975); China/Guangxi (Schawaller 2005).

Leiochrodes lanceolatus Kaszab, 1961

Material: NE India, Arunachal Pradesh, Hunli, 1200–1400 m, 26.V.–1.VI.2012, leg. L. Dembický, 1 ex. ZFMK.

Distribution: China/Yunnan (type locality) (Kaszab 1961b), Nepal (Schawaller 1992), NE India (new record).

Leiochrodes nigronotatus Pic, 1934

Material: China, Yunnan, Jizu Shan, 2300 m, 18.–20.VII.1995, leg. L. Bolm, 2 ex. SMNS. – China, Yunnan, Weibaoshan, 2800–3000 m, 29.–30.VI.1992, leg. V. Kubáň, 1 ex. SMNS. – China, Yunnan, Nujiang Lisu Pref., Gaoligong Shan, 2000 m, 19.VI.2005, leg. M. Schülke, 1 ex. SMNS. – China,

Shaanxi, Taibai Shan, above Houzhenzi, 1700–2300 m, 9.VI.–3.VII.1998, leg. P. JÄGER & J. MARTENS, 1 ex. SMNS. – China, Shaanxi, 15 km S Dongjiangkou, 1700 m, 14.–17.VII.1998, leg. L. BOLM, 3 ex. SMNS.

Distribution: China (KASZAB 1961b).

Leiochrodes sikkimensis Kaszab, 1961

Material: NE India, Arunachal Pradesh, 11 km SSE Tenga, Eagles Nest Sanctuary, 2510 m, 4.V.2008, leg. M. FIKÁČEK, H. PODSKALSKÁ & P. ŠIPEK, 26 ex. NMPC, 3 ex. SMNS.

Distribution: NE India (KASZAB 1961b), Nepal (SCHAWALLER 1992).

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New species of the genus *Menimus* Sharp (Coleoptera: Tenebrionidae: Gnathidiini) from Peninsular Malaysia and adjacent southern Thailand[1]

Wolfgang Schawaller

Abstract

Nine new species of the tenebrionid genus *Menimus* Sharp, 1876 (Diaperinae Latreille, 1802, Gnathidiini Gebien, 1921) from the Peninsular Malaysia and adjacent southern Thailand are described: *M. cameronicus* **n. sp.**, *M. gentingicus* **n. sp.**, *M. hauseri* **n. sp.**, *M. malayicus* **n. sp.**, *M. pahangicus* **n. sp.**, *M. perakicus* **n. sp.**, *M. riedeli* **n. sp.**, and *M. tiomanicus* **n. sp.**, all from Peninsular Malaysia, and *M. khaolakicus* **n. sp.** from southern Thailand. An identification key is compiled for these species. Although certain zoogeographical relations exist between the Malay Peninsula and the Sunda Islands Borneo and Sumatra, only a single species was found at present in both of these areas: *Menimus lineatopunctatus* (Pic, 1930) **n. comb.**, transferred from *Pentaphyllus* (= *Menimus klapperichi* Bremer, 1997 **n. syn.**).

Keywords: Coleoptera, Tenebrionidae, Diaperinae, Gnathidiini, *Menimus*, new species, new combination, new synonym, Malay Peninsula, Malaysia, Sumatra, Thailand.

Zusammenfassung

Neun neue Arten der Tenebrioniden-Gattung *Menimus* Sharp, 1876 (Diaperinae Latreille, 1802, Gnathidiini Gebien, 1921) von W Malaysia und dem angrenzenden südlichen Thailand werden beschrieben: *M. cameronicus* **n. sp.**, *M. gentingicus* **n. sp.**, *M. hauseri* **n. sp.**, *M. malayicus* **n. sp.**, *M. pahangicus* **n. sp.**, *M. perakicus* **n. sp.**, *M. riedeli* **n. sp.**, und *M. tiomanicus* **n. sp.**, alle von Westmalaysia, und *M. khaolakicus* **n. sp.** aus Süd-Thailand. Ein Bestimmungsschlüssel für diese Arten wird erstellt. Obgleich gewisse zoogeographische Beziehungen zwischen der malaiischen Halbinsel und den Sundainseln Borneo und Sumatra bestehen, wurde nur eine einzige Art in beiden dieser Gebiete gefunden: *Menimus lineatopunctatus* (Pic, 1930) **n. comb.**, transferiert von *Pentaphyllus* (= *Menimus klapperichi* Bremer, 1997 **n. syn.**).

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1 Introduction

The tenebrionid genus *Menimus* Sharp, 1876 (Gnathidiini Gebien, 1921, Diaperinae) contains so far more than 70 morphologically very diverse species, distributed in the Oriental, Papuan, Australian, and Pacific regions with a few species reaching the southern areas of the Palaearctic region in Japan, Sikkim (Kaszab 1982), Yunnan (Medvedev 2007, Schawaller 2009), and India and northern Burma (Schawaller 2016). Medvedev (2007) described the first three species from China (Yunnan), listed the species composition of the complete genus with full references, synonymised *Neomenimus* Kaszab, 1939 and discussed some particular morphological features.

So far, species of *Menimus* were unknown from the whole Malay Peninsula including adjacent southern Thailand. However, newly collected specimens in this area represented at least ten species, nine of them new to science described hereunder. The Malay Peninsula runs approximately north-south with a continuous longitudinal mountain range and its terminus is the southernmost point of the Asian mainland (map see Fig. 1). The Peninsula is accompanied by a few small offshore islands (for example Tioman). This area forms a biogeographic unit and contains the southern tip of Myanmar, the whole Peninsular Malaysia (9 species), and adjacent southern Thailand (1 species).

From Borneo and Sumatra two species of *Menimus* are known so far, and a couple of undescribed species are

[1] Contributions to Tenebrionidae, no. 136. – For no. 135 see: Stuttgarter Beiträge zur Naturkunde A, Neue Serie 9 (2016).

available for a forthcoming revision by the present author. Although certain zoogeographical relations exist between these Sunda Islands and the Malay Peninsula, at present only a single species was found in both of these areas.

The species of *Menimus* have an epigean way of life in mature forests, and can be collected mostly by sifting or Berlese/Winkler extractors. Nearly all congeners occur obviously only in small areas because of limited flight abilities.

Acronyms of depositories

HNHM	Hungarian Natural History Museum, Budapest, Hungary
MNHN	Muséum National d'Histoire Naturelle, Paris, France
NHMB	Naturhistorisches Museum, Basel, Switzerland
SMNS	Staatliches Museum für Naturkunde, Stuttgart, Germany

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2 The species of *Menimus* from Peninsular Malaysia and adjacent southern Thailand

Menimus cameronicus n. sp.
(Figs. 3, 12)

Holotype (♂): W Malaysia, Pahang, Cameron Highlands, Tanah Rata, Gn. Jasar, 1300 m, 25.II.1997, leg. R. Schuh, SMNS.

Paratypes: W Malaysia, Pahang, Cameron Highlands, Tanah Rata, Gn. Jasar, 4.IV.1990, leg. A. Riedel, 3 ex. SMNS. – W Malaysia, Pahang, Cameron Highlands, Gn. Beremban, 1.–3.IV.1990, leg. A. Riedel, 1 ex. SMNS. – W Malaysia, Pahang, Cameron Highlands, Gn. Brinchang, 10.V.1990, leg. A. Riedel, 1 ex. HNHM.

Etymology: Named after the Cameron Highlands, where the type series was collected.

Description: Body length 2.8–3.0 mm, body shape round (Fig. 3). Dorsal side dark brownish without colour pattern, without metallic shine, surface shining and without distinct setation, only with a few microsetae, antennae and legs lighter. Head with similar fine punctation as on pronotum. Eyes small, not prominent. Antennae (Fig. 3) with 4-segmented club (antennomeres 7–10), all antennomeres separated, antennomeres 3–6 wider than long. Pronotum widest at base, anterior corners not protruding, posterior corners rectangular, lateral margins straight and without dentation, basal and distal margins unbordered in the middle; surface shining with fine punctation similar as on head, disc convex, without impressions; propleura with a few fine punctures, surface smooth and shagreened; prosternal apophysis prominent. Wings completely reduced. Elytra round, 1.1 times as long as wide, widest in the middle, with irregular punctural rows, punctures distinctly larger than pronotal punctures; intervals flat, wider than punctural rows and with a row of slightly smaller punctures; humeral angles not pronounced; lateral margin without dentation and visible in dorsal view only in basal quarter of elytra; epipleura diminishing somewhat before apex, scattered with a few small punctures, punctures smaller than those on metaventrite. Abdominal ventrites punctate, medial punctures as small as on pronotum, lateral ones somewhat larger, last ventrite 5 unbordered and without modifications. Legs without specific characters, tibiae rounded in cross section and without keel. Aedeagus (Fig. 12) with feebly bent long basale and with long triangular apicale with rounded tip.

Diagnosis: *Menimus cameronicus* n. sp., *M. gentingicus* n. sp., *M. hauseri* n. sp., and *M. pahangicus* n. sp., all from Peninsular Malaysia, form a natural species-group. These four species share a 4-segmented antennal club, larger body size, round body shape, no pronounced humeral angle of the elytra, completely reduced wings, and the lateral margin of elytra visible in dorsal view only in basal quarter of elytra. They can be mainly separated by the structure and punctation of the dorsal surface. *M. cameronicus* n. sp. is the smallest species of this group (body length 2.8–3.0 mm), and can be recognised by the strongly convex pronotum with straight lateral margins. For separation from the other congeners of the Malay Peninsula see the key (section 3).

Menimus gentingicus n. sp.
(Fig. 2)

Holotype (♀): W Malaysia, Genting Highland, 12.IV.1990, leg. A. Riedel, SMNS.

Etymology: Named after the Genting Highland, where the holotype was collected.

Description: Body length 4.4 mm, body shape round (Fig. 2). Dorsal side dark brownish without colour pattern, without metallic shine, surface shining and without distinct setation, only with a few microsetae, antennae and legs lighter. Head with similar fine punctation as on pronotum. Eyes small, not prominent. Antennae

(Fig. 2) with 4-segmented club (antennomeres 7–10), all antennomeres separated, antennomeres 3–6 wider than long. Pronotum widest at base, anterior corners not protruding, posterior corners rectangular, lateral margins slightly rounded and without dentation, basal and distal margins unbordered in the middle; surface shining, with fine punctation similar as on head, disc convex, without impressions; propleura with a few fine punctures, surface smooth and shagreened; prosternal apophysis prominent. Wings completely reduced. Elytra round, 1.05 times as long as wide, widest in the middle, with irregular punctural rows, punctures only slightly larger than pronotal punctures; intervals flat, wider than punctural rows and with a row of slightly smaller punctures; humeral angles not pronounced; lateral margin without dentation and visible in dorsal view only in basal quarter of elytra; epipleura diminishing somewhat before apex, scattered with a few small punctures, punctures smaller than those on metaventrite. Abdominal ventrites punctate, medial punctures as small as on pronotum, lateral ones somewhat larger, last ventrite 5 unbordered and without modifications. Legs without specific characters, tibiae rounded in cross section and without keel. Aedeagus unknown, only female available.

Diagnosis: *Menimus gentingicus* n. sp. is similar to *M. cameronicus* n. sp., but somewhat larger, with wider and flatter pronotum, with slightly rounded lateral margins of pronotum, and with smaller punctures of the elytral rows. See also diagnosis of *M. cameronicus* n. sp. For separation from the other congeners of the Malay Peninsula see the key (section 3).

Menimus hauseri **n. sp.**
(Figs. 4, 13)

Holotype (♂): W Malaysia, Pahang, Cameron Highlands, Tanah Rata, 2.VIII.1999, leg. M. Hauser, SMNS.

Paratypes: W Malaysia, Pahang, Tanah Rata, 3.VIII.1974, leg. G. Minet, 3 ex. NHMB. – W Malaysia, Perak, Tapah, 5.VIII.1974, leg. G. Minet, 2 ex. SMNS. – W Malaysia, Pahang, Cameron Highlands, Gn. Beremban, 1.–3.IV.1990, leg. A. Riedel, 1 ♀ SMNS.

Etymology: Named in honour of Martin Hauser (Sacramento), collector of the holotype.

Description: Body length 4.0–4.5 mm, body shape round (Fig. 4). Dorsal side dark brownish without colour pattern, without metallic shine, surface shining and without distinct setation, only with a few microsetae, antennae and legs lighter. Head with punctuation slightly larger and denser than on pronotum. Eyes small, not prominent. Antennae (Fig. 4) with 4-segmented club (antennomeres 7–10), all antennomeres separated, antennomeres 3–6 wider than long. Pronotum widest at base, anterior corners not protruding, posterior corners rectangular, lateral margins slightly rounded and without dentation, basal and distal margins unbordered in the middle; surface shining, with punctuation finer and sparser than on head, disc convex, without impressions; propleura with a few fine punctures, surface smooth and shagreened; prosternal apophysis prominent. Wings completely reduced. Elytra round, 1.15 times as long as wide, widest in the middle, with irregular, dense punctation with traces of rows, punctures distinctly larger than pronotal punctures; without distinct intervals; humeral angles not pronounced; lateral margin without dentation and visible in dorsal view only in basal quarter of elytra; epipleura diminishing somewhat before apex, scattered with a few small punctures, punctures smaller than those on metaventrite. Abdominal ventrites punctate, medial punctures as small as on pronotum, lateral ones somewhat larger, last ventrite 5 unbordered and without modifications. Legs without specific characters, tibiae rounded in cross section and without keel. Aedeagus (Fig. 13) with feebly bent long basale and with long finger-like apicale with rounded tip.

Diagnosis: *Menimus hauseri* n. sp. can be recognised mainly by the elytra with irregular dense punctures with only traces of punctural rows, and without distinctly separated intervals. See also diagnosis of *M. cameronicus* n. sp. For separation from the other congeners of the Malay Peninsula see the key (section 3).

Menimus khaolakicus **n. sp.**
(Figs. 10, 16)

Holotype (♂): Thailand, Khao Lak NP, Thone Chong Fa Fall, 100–300 m, 6.–15.I.1998, leg. A. Schulz & K. Vock, SMNS.

Paratypes: Same data as holotype, 5 ex. SMNS, 1 ex. HNHM, 1 ex. NHMB.

Etymology: Named after the Khao Lak National Park in south-western Thailand, where the type series was collected.

Description: Body length 1.5–1.7 mm, body shape elongate parallel-sided (Fig. 10). Dorsal side light brownish without colour pattern, without metallic shine, surface shining and without distinct setation, only with a few microsetae, antennae and legs lighter. Head with punctation similar as on pronotum. Eyes reduced, not prominent. Antennae (Fig. 10) with 3-segmented club (antennomeres 8–10), all antennomeres separated, antennomeres 3–7 wider than long. Pronotum widest in the middle, anterior corners slightly protruding, posterior corners rectangular, lateral margins rounded and with fine dentation, basal and distal margins unbordered in the middle; surface shining, with punctation similar as on head, disc convex, without impressions; propleura with a few fine punctures, surface smooth and shining; prosternal apophysis not prominent, bent down. Wings fully developed. Elytra elongate parallel-sided, 1.35 times as long as wide,

widest at base, with irregular, dense punctural rows, punctures slightly larger than pronotal punctures; intervals flat, narrower than punctural rows and with some similar large punctures; humeral angles pronounced; lateral margin with fine dentation and visible in dorsal view only in basal quarter of elytra; epipleura diminishing somewhat before apex, scattered with a few small punctures, punctures smaller than those on metaventrite. Abdominal ventrites punctate, medial punctures as small as on pronotum, lateral ones somewhat larger, last ventrite 5 unbordered and without modifications. Legs without specific characters, tibiae rounded in cross section and without any keel. Aedeagus (Fig. 16) with feebly bent long basale and with tongue-like apicale with rounded tip, basale nearly 3 times as long as apicale.

Diagnosis: *Menimus khaolakicus* n. sp. can be recognised by the small body size below 2 mm, by the elongate parallel-sided elytra, by the 3-segmented antennal club, by the elytra with distinct and dense, irregular punctural rows, and by the shape of the aedeagus. *M. perakicus* n. sp. is similar, but larger (2.3 mm), and the punctures of elytral rows distinctly larger than pronotal punctures. The aedeagi cannot be compared because only a female is known of *M. perakicus* n. sp. In contrary, *M. lineatopunctatus* and *M. tiomanicus* n. sp. have a 4-segmented antennal club. For separation from the other congeners of the Malay Peninsula see also the key (section 3).

Menimus lineatopunctatus (Pic, 1930) **n. comb.**
(Fig. 7)

Pentaphyllus lineatopunctatus Pic, 1930: 34.
Menimus klapperichi Bremer, 1997: 68 **n. syn.** (O. Merkl, personal communication).

Examined type material: 2 syntypes (sex not examined) of *Pentaphyllus lineatopunctatus*, Sumatra, Palembang, coll. M. Pic [1 ex. labelled by O. Merkl 2003 as lectotype], MNHN. – Holotype (sex not examined) and 4 paratypes of *Menimus klapperichi* Sumatra, Prov. Aceh-Salatan, Babahrot, 100 m, 15.–20.VIII1983, leg. J. Klapperich, HNHM.

Other material examined: W Malaysia, Pahang, Tioman Island, Kampung Tekek, 16.–24.VII.1993, leg. R. Schuh, 1 ♀ SMNS.

Synonymy: Ottó Merkl (personal communication) studied the type series of *Pentaphyllus lineatopunctatus* Pic, 1930, recognised the generic misplacement, labelled a lectotype specimen, and recognised that *P. lineatopunctatus* Pic, 1930 is identical with *Menimus klapperichi* Bremer, 1997 (Pic 1930, Bremer 1997). However, this new combination and synonymy was not yet published so far.

Remarks: *Menimus lineatopunctatus* (Pic, 1930) and *M. tiomanicus* n. sp., occur both on the small Tioman Island, are quite similar, and share the small body size around 1.8–2.0 mm, the elongate parallel-sided elytra, the 4-segmented antennal club, and the elytra with distinct and dense, irregular punctural rows. However, *M. lineatopunctatus* is slightly larger (2 mm), the pronotum and elytra are higher convex and their lateral margins have a fine dentation, and the pronotum has a denser and larger punctation. In contrary, *M. khaolakicus* n. sp. and *M. perakicus* n. sp. have a 3-segmented antennal club. For separation from the other congeners of the Malay Peninsula see also the key (section 3).

Type localities: "Palembang" (*P. lineatopunctatus*), "Bahbarot" (*M. klapperichi*).

Distribution: Sumatra (type localities), W Malaysia (new record).

Menimus malayicus **n. sp.**
(Figs. 11, 15)

Holotype (♂): W Malaysia, Cameron Highlands, Gn. Beremban, 1.–3.IV.1990, leg. A. Riedel, SMNS.

Paratypes: Same data as holotype, 1 ♀ SMNS. – W Malaysia, Cameron Highlands, Gn. Beremban, 1600–1800 m, 29.VII.1993, leg. R. Schuh, 1 ♀ SMNS. – W Malaysia, Kelantan, road between Kampong Raja and Gua Musang, 1400–1700 m, 1.–28.IV.2006, leg. P. Čechovský, 2 ex. SMNS.

Etymology: Named after the Malay Peninsula, where the type specimens were collected.

Description: Body length 3.8–4.1 mm, body shape slightly ovate, nearly parallel-sided (Fig. 11). Dorsal side brownish without colour pattern, without metallic shine, surface shining and without distinct setation, only with a few microsetae and a few longer (? tactile) setae along lateral elytral margin, antennae and legs lighter. Head with slightly larger and denser punctation than on pronotum. Eyes small, not prominent. Antennae (Fig. 11) with 4-segmented club (antennomeres 7–10), all antennomeres separated, antennomeres 3–6 wider than long. Pronotum widest in posterior third, anterior corners not protruding, posterior corners rectangular, lateral margins nearly straight and with traces of a fine dentation, distal margin completely bordered, basal margin unbordered in the middle; surface shining, with punctation finer and sparser than on head, disc convex, without impressions; propleura with a few fine punctures, surface smooth and shining; prosternal apophysis not prominent, bent down. Wings fully developed. Elytra slightly ovate, nearly parallel-sided, 1.45 times as long as wide, widest in the middle, with irregular, dense punctural rows, punctures larger than on pronotum; intervals flat, wider than punctural rows and with some smaller punctures; humeral angles pronounced; lateral margin with fine dentation and visible in dorsal view nearly throughout whole length; epipleura diminishing somewhat before apex, scattered with a few small punctures, punctures smaller than those on

metaventrite. Abdominal ventrites finely punctate, medial punctures as small as on pronotum, lateral ones somewhat larger, last ventrite 5 unbordered and without modifications. Legs without specific characters, tibiae rounded in cross section and without keel. Aedeagus (Fig. 15) with feebly bent short basale and with broad finger-like apicale with rounded tip.

D i a g n o s i s : *Menimus malayicus* n. sp. is most similar to *M. seriepunctatus* Gebien, 1927 from Sumatra, both having similar body size and shape, and also similar dorsal punctation. However, *M. seriepunctatus* is much more convex, and the lateral margins of elytra are visible in dorsal view only in the basal quarter of elytra. This species will be redescribed and figured in a forthcoming article about *Menimus* from Borneo and Sumatra. For separation from the other congeners of the Malay Peninsula see the key (section 3).

Menimus pahangicus **n. sp.**
(Figs. 5, 14)

H o l o t y p e (♂): W Malaysia, Pahang, Tanah Rata, 3.VIII.1974, leg. G. MINET, NHMB.

P a r a t y p e s : Same data as holotype, 2 ex. NHMB, 2 ex. SMNS. – W Malaysia, Perak, Tapah, 5.VIII.1974, leg. G. MINET, 3 ex. NHMB, 1 ex. HNHM.

E t y m o l o g y : Named after the sultanate Pahang, where some of the type specimens including the holotype were collected.

D e s c r i p t i o n : Body length 5.0–5.5 mm, body shape round (Fig. 5). Dorsal side dark brownish without colour pattern, without metallic shine, surface dull shagreened and without distinct setation, only with a few microsetae, antennae and legs lighter. Head with fine punctation slightly larger and denser than on pronotum. Eyes small, not prominent. Antennae (Fig. 5) with

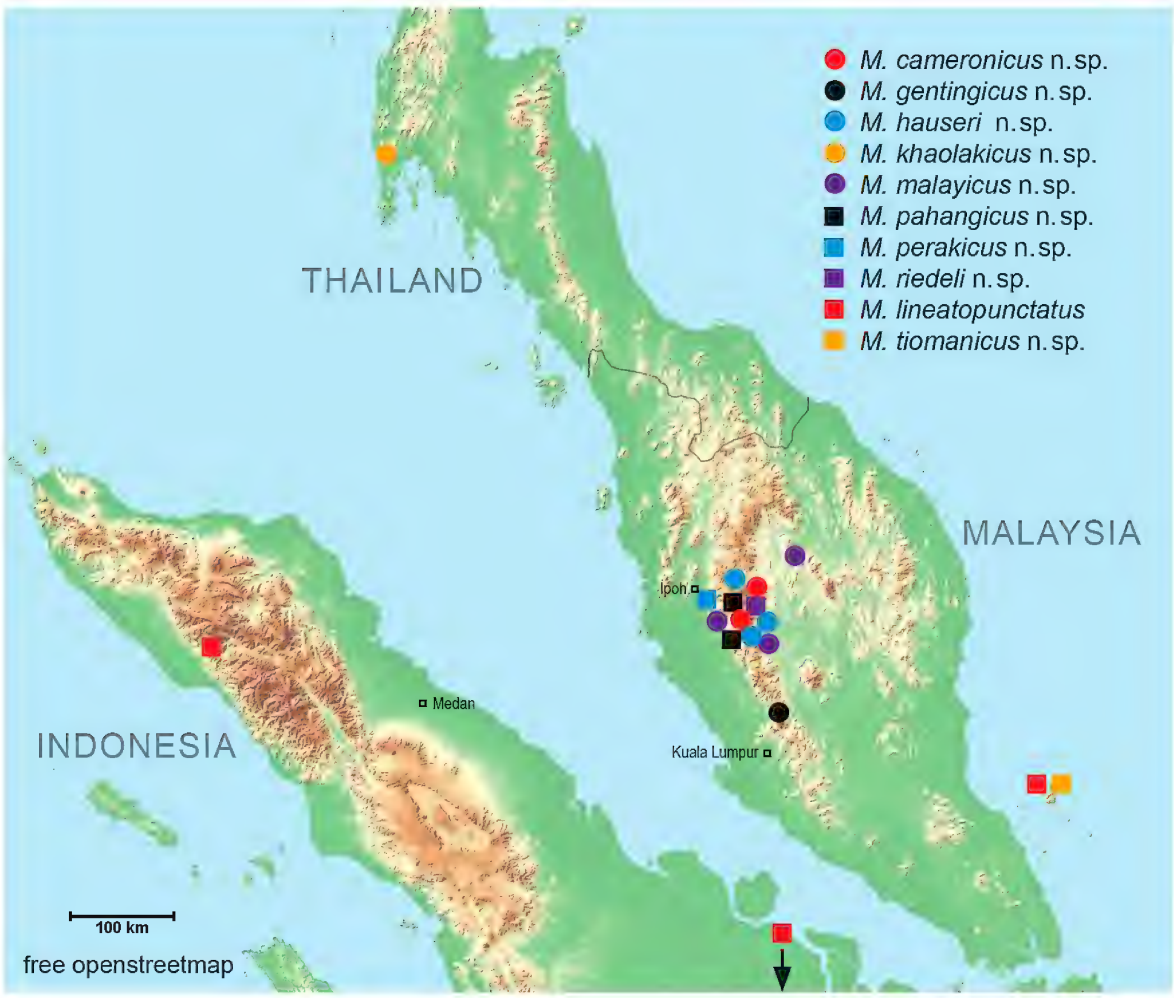


Fig. 1. Localities of *Menimus* in Peninsular Malaysia and adjacent southern Thailand.

4-segmented club (antennomeres 7–10), all antennomeres separated, antennomere 3 longer than wide, antennomeres 4–6 wider than long. Pronotum widest at base, anterior corners not protruding, posterior corners rectangular, lateral margins slightly rounded and without dentation, basal and distal margins unbordered in the middle; surface dull shagreened, with punctation finer and sparser than on head, punctures nearly invisible on shagreened surface, disc convex, without impressions; propleura with a few fine punctures, surface smooth and shagreened; prosternal apophysis prominent. Wings completely reduced. Elytra round, 1.1 times as long as wide, widest in the middle, impunctate, surface dull shagreened and slightly wrinkled; humeral angles not pronounced; lateral margin without dentation and visible in dorsal view only in basal quarter of elytra; epipleura diminishing somewhat before apex, scattered with a few small punctures, punctures smaller than those on metaventrite. Abdominal ventrites dull shagreened and without punctation, last ventrite 5 unbordered and without modifications. Legs without specific characters, tibiae rounded in cross section and without keel. Aedeagus (Fig. 14) with feebly bent long basale and with long finger-like apicale with rounded tip.

Diagnosis: *Menimus pahangicus* n. sp. can be recognised mainly by the large body size around 5 mm, by the dull shagreened dorsal surface, and by the impunctate elytra. See also diagnosis of *M. cameronicus* n. sp. For separation from the other congeners of the Malay Peninsula see the key (section 3).

Menimus perakicus **n. sp.**
(Fig. 9)

Holotype (♀): W Malaysia, Perak, 40 km SE Ipoh, Banjaran Titi Wangsa, Ringlet, 900 m, 29.III.–15.IV.2004, leg. P. Čechovský, SMNS.

Etymology: Named after the sultanate Perak, where the holotype was collected.

Description: Body length 2.3 mm, body shape elongate parallel-sided (Fig. 9). Dorsal side brownish without colour pattern, without metallic shine, surface shining and without distinct setation, only with a few microsetae, antennae and legs lighter. Head with punctation similar as on pronotum. Eyes small, not prominent. Antennae (Fig. 9) with 3-segmented club (antennomeres 8–10), all antennomeres separated, antennomeres 3–7 wider than long. Pronotum widest in the middle, anterior corners slightly protruding, posterior corners rectangular, lateral margins rounded and with fine dentation, basal and distal margins unbordered in the middle; surface shining, with punctation similar as on head, disc convex, without impressions; propleura with coarse confluent punctation, surface somewhat wrinkled and shining; prosternal apophysis not prominent, bent down. Wings fully developed. Elytra elongate parallel-sided, 1.6 times as long as wide, widest at base, with irregular, dense punctural rows, punctures distinctly larger than pronotal punctures; intervals flat, narrower than punctural rows and with a few fine punctures; humeral angles pronounced; lateral margin with fine dentation and visible in dorsal view in basal half of elytra; epipleura diminishing somewhat before apex, scattered with a few small punctures, punctures smaller than those on metaventrite. Abdominal ventrites punctate, medial punctures smaller and sparser than on pronotum, lateral punctures somewhat larger, last ventrite 5 unbordered and without modifications. Legs without specific characters, tibiae rounded in cross section and without keel. Aedeagus unknown, only female available.

Diagnosis: *Menimus perakicus* n. sp. can be recognised by the small body size around 2.3 mm, by the elongate parallel-sided elytra, by the 3-segmented antennal club, and by the elytra with distinct and dense, irregular punctural rows. *M. khaolakicus* n. sp. is similar, but smaller (1.5–1.7 mm) and the punctures of elytral rows only slightly larger than pronotal punctures. In contrary, *M. lineatopunctatus* and *M. tiomanicus* n. sp. have a 4-segmented antennal club. For separation from the other congeners of the Malay Peninsula see also the key (section 3).

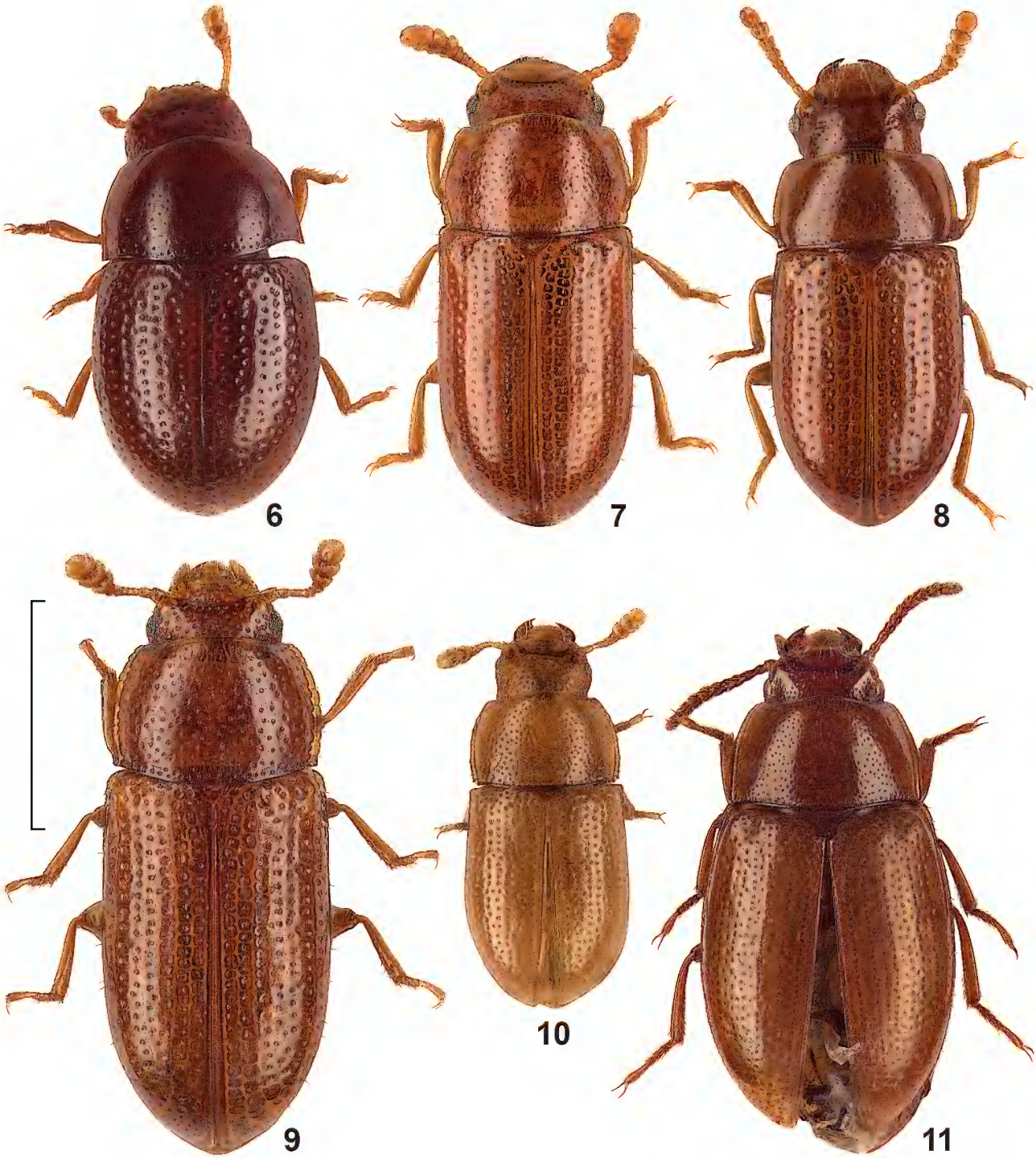
Menimus riedeli **n. sp.**
(Fig. 6)

Holotype (♀): W Malaysia, Pahang, Cameron Highlands, Gn. Beremban, 1.–3.IV.1990, leg. A. Riedel, SMNS.

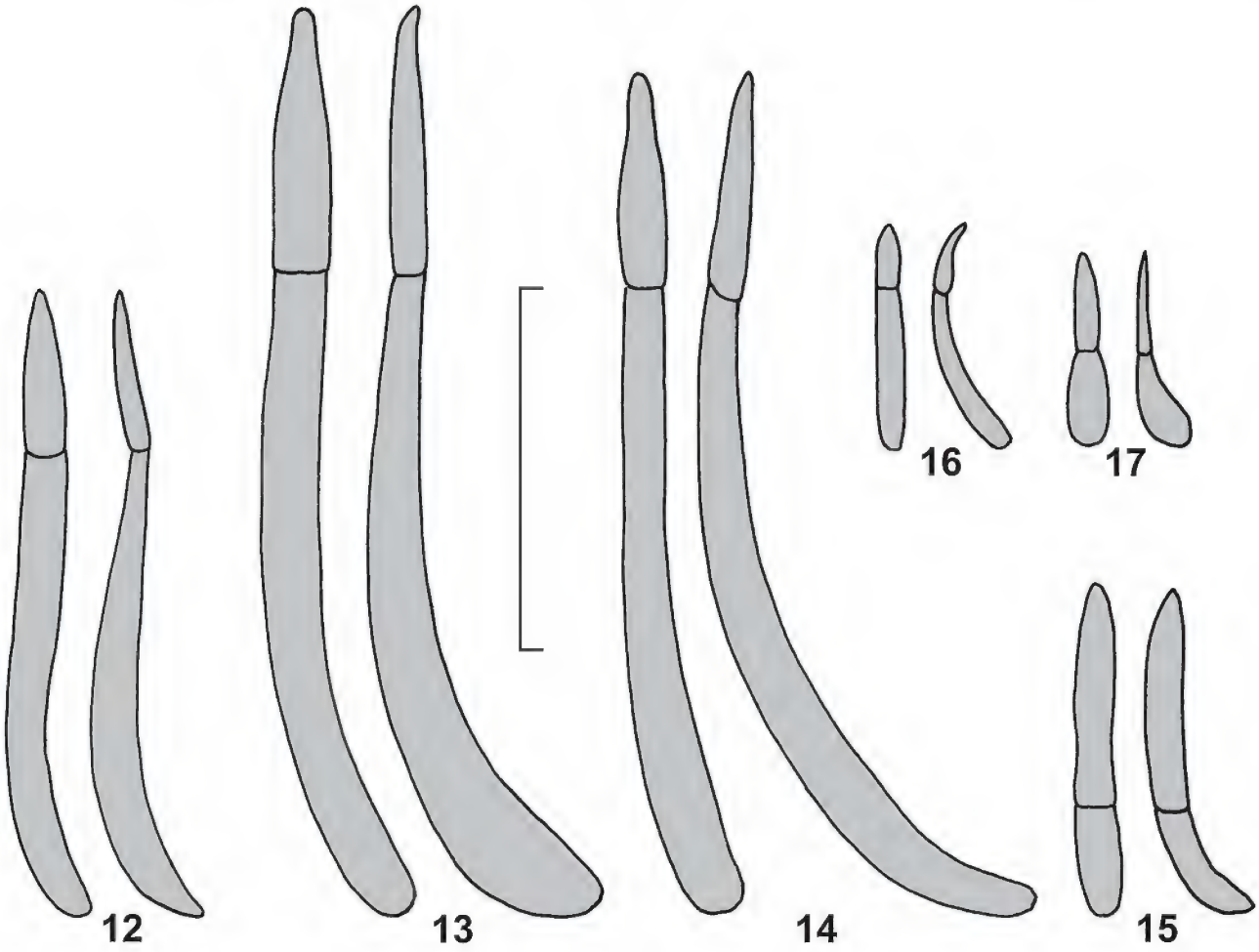
Etymology: Named in honour of Alexander Riedel (Karlsruhe), collector of the holotype and other congeners in W Malaysia.

Description: Body length 1.7 mm, body shape ovate (Fig. 6). Dorsal side brownish without colour pattern, without metallic shine, surface shining and without distinct setation, only with a few microsetae, antennae and legs lighter. Head with punctation similar as on pronotum. Eyes completely reduced. Antennae (Fig. 6) with 3-segmented club (antennomeres 8–10), all antennomeres separated, antennomeres 3–7 wider than long. Pronotum widest behind middle, anterior corners not protruding, posterior corners rectangular, lateral margins rounded and without dentation, basal and distal margins unbordered in the middle; surface shining, with punctation similar as on head, disc convex, without impressions; propleura with a few fine punctures, surface smooth and shining; prosternal apophysis slightly prominent, bent down. Wings completely reduced. Elytra ovate, 1.2 times as long as wide, widest before middle, with irregular, punctural rows, punctures larger than pronotal punctures; intervals flat, broader than punctural rows and with a few punctures of similar size; humeral angles not pronounced; lateral margin without dentation and visible in dorsal view only near

Figs. 2–5. Dorsal view of *Menimus* from Peninsular Malaysia and adjacent southern Thailand. – **2**. *M. gentingicus* n. sp., ♀ holotype SMNS. **3**. *M. cameronicus* n. sp., ♂ holotype SMNS. **4**. *M. hauseri* n. sp., ♂ holotype SMNS. **5**. *M. pahangicus* n. sp., ♂ holotype NHMB. – Scale: 1 mm.



Figs. 6–11. Dorsal view of *Menimus* from Peninsular Malaysia and adjacent southern Thailand. – **6**. *M. riedeli* n. sp., ♀ holotype SMNS. **7**. *M. lineatopunctatus*, ♀ non-type SMNS. **8**. *M. tiomanicus* n. sp., ♂ holotype SMNS. **9**. *M. perakicus* n. sp., ♀ holotype SMNS. **10**. *M. khaolakicus* n. sp., ♂ holotype SMNS. **11**. *M. malayicus* n. sp., ♂ holotype SMNS. – Scale: 1 mm.



Figs. 12–17. Aedeagus of *Menimus* from Peninsular Malaysia and adjacent southern Thailand. – **12**. *M. cameronicus* n. sp., ♂ holotype SMNS. **13**. *M. hauseri* n. sp., ♂ holotype SMNS. **14**. *M. pahangicus* n. sp., ♂ holotype NHMB. **15**. *M. malayicus* n. sp., ♂ holotype SMNS. **16**. *M. khaolakicus* n. sp., ♂ holotype SMNS. **17**. *M. tiomanicus* n. sp., ♂ holotype SMNS. – Scale: 1 mm (12–15), 0.5 mm (16–17).

shoulders; epipleura diminishing somewhat before apex, scattered with a few punctures, punctures similar as those on metaventrite. Abdominal ventrites punctate, punctures similar as on pronotum, last ventrite 5 unbordered and without modifications. Legs without specific characters, tibiae rounded in cross section and without keel. Aedeagus unknown, only female available.

Diagnosis: *Menimus riedeli* n. sp. can be recognised by the small body size below 2 mm, by the ovate body shape, by the convex elytra with irregular punctural rows and the lateral margin visible in dorsal view only near shoulders, and by the 3-segmented antennal club. All other small *Menimus* species from the Malay Peninsula have elongate parallel-sided body shape, and partly also a 4-segmented antennal club. For separation from the other congeners of the Malay Peninsula see also the key (section 3).

Menimus tiomanicus **n. sp.**
(Figs. 8, 17)

Holotype (♂): W Malaysia, Pahang, Tioman Island, Kampung Tekek, 16.–24.VII.1993, leg. R. Schuh, SMNS.

Etymology: Named after the Tioman Island, about 50 km east of the southern Malay Peninsula, where the holotype was collected.

Description: Body length 1.8 mm, body shape elongate parallel-sided (Fig. 8). Dorsal side light brownish without colour pattern, without metallic shine, surface shining and without distinct setation, only with a few microsetae, antennae and legs lighter. Head with punctation similar as on pronotum. Eyes small, not prominent. Antennae (Fig. 8) with 4-segmented club (antennomeres 7–10), all antennomeres separated, antennomeres 3–6 wider than long. Pronotum widest behind middle, anterior

corners not protruding, posterior corners rectangular, lateral margins rounded and without dentation, basal margin completely bordered, distal margin unbordered in the middle; surface shining, with punctation similar as on head, disc convex, without impressions; propleura with a few fine punctures, surface smooth and shining; prosternal apophysis not prominent, bent down. Wings fully developed. Elytra elongate parallel-sided, 1.4 times as long as wide, widest at base, with irregular, punctural rows, punctures larger than on pronotum; intervals flat, broader than punctural rows and with a few fine punctures; humeral angles pronounced; lateral margin without dentation and visible in dorsal view only in basal half of elytra; epipleura diminishing somewhat before apex, scattered with a few small punctures, punctures smaller than those on metaventrite. Abdominal ventrites punctate, medial punctures smaller than on pronotum, last ventrite 5 unbordered and without modifications. Legs without specific characters, tibiae rounded in cross section and without keel. Aedeagus (Fig. 17) with short basale bent at base and with triangular apicale with acute tip, basale as long as apicale.

Diagnosis: See *Menimus lineatopunctatus* (Pic, 1930) n. comb. For separation from the other congeners of the Malay Peninsula see the key (section 3).

3 Identification key of *Menimus* from Peninsular Malaysia and adjacent southern Thailand

1 Larger species, body length 2.8–5.5 mm, antennae with 4-segmented club. **2**
– Smaller species, body length 1.5–2.3 mm, antennae with 3- or 4-segmented club. **6**
2 Body shape slightly ovate, nearly parallel-sided, humeral angle pronounced and wings present, lateral margin of elytra visible in dorsal view nearly throughout whole length. – Figs. 11, 15. ..... ***malayicus* n. sp.**
– Body shape round, humeral angle not pronounced and wings completely reduced, lateral margin of elytra visible in dorsal view only in basal quarter of elytra. **3**
3 Surface of pronotum and elytra dull shagreened, elytra impunctate and surface slightly wrinkled, body length 5.0–5.5 mm. – Figs. 5, 14. ..... ***pahangicus* n. sp.**
– Surface of pronotum and elytra shining, elytra punctate and surface smooth, body length 2.8–4.5 mm. **4**
4 Whole elytra with irregular dense punctation with only traces of punctural rows, intervals not distinctly separated. – Figs. 4, 13. ..... ***hauseri* n. sp.**
– Elytra with irregular punctural rows and with separated intervals. **5**
5 Pronotum conical and strongly convex, lateral margins straight, punctures of elytral rows distinctly larger than pronotal punctures, body length 2.8–3.0 mm. – Figs. 3, 12. ..... ***cameronicus* n. sp.**
– Pronotum broader and flatter, lateral margins slightly rounded, punctures of elytral rows only slightly larger than pronotal punctures, body length 4.4 mm. – Fig. 2. ..... ***gentingicus* n. sp.**
6 Antennae with 3-segmented club. **7**
– Antennae with 4-segmented club. **9**
7 Body shape ovate, eyes completely reduced. – Fig. 6. ..... ***riedeli* n. sp.**
– Body shape elongate parallel-sided, eyes small, not prominent, but present. **8**
8 Body length 2.3 mm, elytra combined 1.6 times as long as wide, punctures of elytral rows distinctly larger than pronotal punctures. – Fig. 9. ..... ***perakicus* n. sp.**
– Body length 1.5–1.7 mm, joint elytra 1.35 times as long as wide, punctures of elytral rows slightly larger than pronotal punctures. – Figs. 10, 16. ..... ***khaolakicus* n. sp.**
9 Body length 1.8 mm, elytra combined 1.4 times as long as wide, pronotum and elytra flatter, their lateral margins without dentation. – Figs. 8, 17. ..... ***tiomanicus* n. sp.**
– Body length 2.0 mm, joint elytra 1.5 times as long as wide, pronotum and elytra highly convex, their lateral margins with fine dentation. – Fig. 7. ..... ***lineatopunctatus***

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Review of the Icelandic bee fauna (Hymenoptera: Apoidea: Anthophila)

Anselm Kratochwil

Abstract

Only one species of the Hymenoptera Apoidea Anthophila is native to Iceland: *Bombus jonellus* (Kirby, 1802). A second species, *Andrena tarsata* Nylander, 1848, is mentioned by Schmiedeknecht (1882–1884), but there is reasonable doubt of an existence in Iceland. Four bumblebee species were introduced: *B. hortorum* (Linnaeus, 1761), first detection in 1959; *B. lucorum* (Linnaeus, 1761), first detection in 1979; *B. hypnorum* (Linnaeus, 1758) and *B. pascuorum* (Scopoli, 1763), first detections in 2010. Furthermore *B. terrestris* (Linnaeus, 1761) was introduced for tomato pollination in greenhouses (after 2002). Personal observations in 2014 yielded the result of large extensions of *B. lucorum* primarily in the north-east region of Iceland. The distribution of all bumblebee species in Iceland is summarised, their taxonomical status, habitat preferences, special adaptations and colonisation history are discussed. Based on a differential evaluation, probable trends of their future development are examined. Global warming effects may reduce *B. jonellus* populations and promote those of introduced *Bombus* species. *B. lucorum* may expand in many regions of Iceland far from settlements, but also into cultivated and settlement areas. *B. hortorum* is restricted to settlement areas with gardens (preferring long-tubed flowers), but *B. lucorum* will compete strongly with *B. hortorum*. *B. hypnorum* is also restricted to settlement areas, due to special nesting behaviour. The further development of *B. pascuorum* is likely to be positively supported by global warming effects and competitive effects. *B. terrestris* seems to be not adapted to live outside greenhouses in Iceland.

Key words: *Bombus*, *Andrena*, Iceland, global warming, introduced species, flower visits.

Zusammenfassung

Nur eine Art unter den apoiden Hymenopteren ist in Island heimisch: *Bombus jonellus* (Kirby, 1802). Eine zweite Art, *Andrena tarsata* Nylander, 1848, wurde von Schmiedeknecht (1882–1884) erwähnt; ihr Vorkommen erscheint sehr zweifelhaft. Vier Hummelarten wurden bisher eingeführt: *B. hortorum* (Linnaeus, 1761), erster Nachweis 1959; *B. lucorum* (Linnaeus, 1761), erster Nachweis 1979; *B. hypnorum* (Linnaeus, 1758) und *B. pascuorum* (Scopoli, 1763), erste Nachweise 2010. Ferner wird *B. terrestris* (Linnaeus, 1761) zur Bestäubung von Tomaten in Gewächshäusern in Island eingesetzt (seit 2002). Beobachtungen im Jahr 2014 erbrachten das Ergebnis einer starken Ausbreitung von *B. lucorum* besonders im Nordosten Islands. Die heutige Verbreitung aller in Island vorkommenden Hummelarten wird vorgestellt und Angaben über ihren taxonomischen Status, Habitat-Präferenzen, besondere Anpassungen und Besiedlungsgeschichte angeführt. Über eine vergleichende Analyse wird die zukünftige Entwicklung diskutiert. Die Auswirkungen der globalen Erderwärmung sollten *B. jonellus* zurückdrängen und einzelne eingeführte *Bombus*-Arten fördern. *B. lucorum* wird sich weiter ausbreiten (sowohl außerhalb des Bereichs der Siedlungen und des kultivierten Gebietes als auch innerhalb). *B. hortorum* ist auf Siedlungsgebiete mit Gärten beschränkt (Bevorzugung tiefkroniger Blüten). Jedoch wird *B. lucorum* mit *B. hortorum* um Nektarquellen stark konkurrieren. *B. hypnorum* ist aufgrund seines spezifischen Nistverhaltens ebenfalls weitgehend auf Siedlungsgebiete beschränkt. Die weitere Entwicklung von *B. pascuorum* wird wahrscheinlich ebenfalls durch die Effekte der globalen Erwärmung und die höhere Wettbewerbsfähigkeit positiv beeinflusst werden. *B. terrestris* kann außerhalb von Gewächshäusern in Island derzeit langzeitig nicht überleben.

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1 Introduction

Within the Hymenoptera Apoidea Anthophila only a single species of the genus *Bombus* is native to Iceland: *Bombus (Pyrobombus) jonellus* (Kirby, 1802), see KLINCKOWSTRÖM (1913) and PRŶS-JONES et al. (1981). This is also documented in a chronological bibliographical study from ca. 1680 to 1980 concerning bumblebee observations in Iceland by PRŶS-JONES et al. (1981).

Another bee species is being discussed as possibly native: *Andrena tarsata* Nylander, 1848 (oligolectic to *Potentilla* species), see GUSENLEITNER & SCHWARZ (2002). But there is only one reference 'Auch in Island ist sie gefunden worden [also found in Iceland]' without further comments (SCHMIEDEKNECHT 1882–1884: 769). No other observation of *A. tarsata* has been detected for Iceland, so that there is reasonable doubt of the existence of this species there.

In contrast to the obviously native *B. jonellus*, PRŶS-JONES et al. (1981) detected two other new *Bombus* species for Iceland, both of which can be classified as introduced: *B. (Megabombus) hortorum* (Linnaeus, 1761) and *B. (Bombus) lucorum* (Linnaeus, 1761). *B. hortorum* was found in the Reykjavík region and surroundings and has been represented in insect collections since 1959. *B. lucorum* occurs also in the vicinity of Reykjavík, where it was first observed on June 29, 1979. PRŶS-JONES et al. (1981) summarise the state of knowledge of the distribution and foraging behaviour of the three bumblebee species.

In IceNews (2010) an article with the title 'More new bees in Iceland' was published and it was reported that two further bumblebee species are meanwhile present in Iceland: *B. (Pyrobombus) hypnorum* (Linnaeus, 1758) (Keflavík, Hafnarfjörður and Reykjavík) and *B. (Thoracobombus) pascuorum* (Scopoli, 1763) (Hveragerði, Akureyri). In 2010, the first queens were found, indicating a successful establishment of both species. So until now the Islandic bee fauna comprises one native and four introduced bumblebee species (IceNews 2010). There is another *Bombus* species, *B. (Bombus) terrestris* (Linnaeus, 1758), which was introduced for tomato pollination in greenhouses (after 2002). No information is yet available as to whether *B. terrestris* individuals escaped and live in free nature.

Observations of bumblebees in the year 2014 along a transect from east to west coast of Iceland should bring new information about the present situation of the bumblebee distribution, including preferred foraging plants, with special interest in the introduced bumblebee species. The development of mega databases concerning *Bombus* species deposited in collections of museums or recorded represent a further source of information. Since the publication of PRŶS-JONES et al. (1981) no approach was taken to summarise the bumblebee colonisation in Iceland. A provisional evaluation is provided here.

Some questions about the observed introduced individuals and species, their present distribution, hypotheses of future development including potential effects of global warming and competition between species will be discussed.

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2 Material and methods

The observation in Iceland was carried out from June 3 to June 18 in 2014, also including the northeast region with former scarce bumblebee detections (see Fig. 1, PRŶS-JONES et al. 1981). 26 specimens (IS1–IS26) were collected. The route covers the following localities: Seyðisfjörður, Nardvík, Borgarfjörður, Svartiskógur, Burstafell, Porshöfn, Raufarhöfn, Húsavík, Mývatn, Akureyri, Námafjall, Goðafoss, Breiðavík, Látrabjarg, Reykjavík, Seljalandsfoss, Skógafoss, Djúpivogur. Information about flower visits is added, and observations in gardens are indicated (botanical terminology according to KRISTINSSON 2010 and www.iceland-nh.net 2015: 'Plants of Iceland').

The data of PRŶS-JONES et al. (1981) were digitised and, using Natural Earth (Free vector and raster map data; www.naturalearthdata.com 2015) as base map, the distribution data of PRŶS-JONES et al. (1981), my own data and all available further data were compiled with QGIS version 2.8.1 Wien (www.qgis.org 2015) in the WGS84/Pseudo-Mercator reference system. The distribution maps show a UTM grid of 50 × 50 kilometer squares. One grid point covers an area of 25 × 25 km.

The following internet data bases were used: Global Biodiversity Information Facility (Copenhagen, Denmark [GBIF] including Naturalis Biodiversity Center [Leiden, Netherlands] and Lund Museum of Zoology [Sweden]; www.gbif.org 2015). Specimens from the collections in the National Museum of Natural History (RMNH; Rijksmuseum voor Natuurlijke History), later National Museum of Natural History, Naturalis in Leiden and the Zoological Museum Amsterdam (ZMA) and further acquisitions were examined. One record is from the American Museum of Natural History, New York (AMNH).

The data on the observed and collected specimens are arranged as follows: code number, worker/queen, locality, date, latitude, longitude, elevation, flower visit. The arrangement of the GBIF data is: identity number, worker/queen, locality, date, further comments.

3 Results and discussion

3.1 *Bombus (Pyrobombus) jonellus subborealis* Richards, 1933

Status

B. jonellus was described by Kirby (1802). Primarily shown by Vogt (1911), *B. jonellus* varied geographically in morphology. Vogt (1911) differentiated three varieties (var. geogr.): 1) *martes* Gerstaecker, 1869: Alps; 2) *typicus*: England, Germany (but not the Bavarian Alps) and southern Ural; 3) *atrocorbiculosus*: Scotland, Orkney Islands, Iceland, Norway, Amur region. Within the group 3 Vogt (1911) differentiated two further groups: a) 'Forma nova' *sparreschneiderianus* and b) 'Forma nova' *horsleyi* (only northern Scotland, Orkney Islands). Today different subspecies were classified. In Iceland the subspecies *subborealis* Richards, 1933 is distributed (Richards 1933, Løken 1973).

Richards (1933) differentiated the following subspecies: 1) *Bombus jonellus jonellus* (Kirby, 1802): England, Scotland (including Orkneys but not Hebrides), Ireland, Belgium, France, Germany, Austria (except Alps), probably Southern Scandinavia and South Russia; 2) *B. j. vogtii* Richards, 1933 (*B. j. atrocorbiculosus* [Vogt, 1911] pars parte): Shetland; 3) *B. j. hebridensis* (Wild, 1931): Hebrides; 4) *B. j. suecicus* (Friese, 1911) (*B. j. atrocorbiculosus* [Vogt, 1911] pars parte): Sweden; 5) *B. j. subborealis* Richards, 1933 (*B. j. atrocorbiculosus* [Vogt, 1911] pars parte): Norway, Iceland; 6) *B. j. martes* (Gerstaecker, 1869): higher levels of Bavaria (Germany) and Alps.

Observed specimens

Eight queens and four workers were detected. — IS2: queen, 4.VI.2014, east of Borgarfjörður, 65°30′56.20″N, 13°47′33.00″W, 5 m, *Salix lanata*; IS3: queen, 4.VI.2014, Svartiskógur, 65°30′46.75″N, 14°33′54.75″W, 74 m, *Salix lanata*; IS4: queen, 4.VI.2014, Svartiskógur, 65°30′46.75″N, 14°33′54.75″W, 74 m, *Salix lanata*; IS5: queen, 4.VI.2014, Svartiskógur, 65°30′46.75″N, 14°33′54.75″W, 74 m, *Salix lanata*; IS6: worker, 6.VI.2014, Porshöfn, 66°11′54.88″N, 15°19′41.87″W, 9 m, *Salix lanata*; IS12: queen, 7.VI.2014, Snartastaðakirkja, Kópasker, 66°17′43.62″N, 16°25′29.77″W, 12 m, *Salix callicarpaea*; IS13: queen, 7.VI.2014, Snartastaðakirkja, Kópasker, 66°17′43.62″N, 16°25′29.77″W, 12 m, *Salix callicarpaea*; IS16: queen, 7.VI.2014, Skinnastaðir, Jökulsá á Fjöllum, 66°2′9.96″N, 16°26′16.54″W, 39 m, *Salix phylicifolia*; IS17: queen, 7.VI.2014, Ásbyrgi, 66°0′5.88″N, 16°30′49.61″W, 85 m, *Taraxacum officinale* agg., *Salix lanata*; IS19: worker, 9.VI.2014, Akureyri, 65°40′29.85″N, 18°5′39.04″W, 60 m, *Taraxacum officinale* agg.; IS24: worker, 9.VI.2014, Akureyri, 65°40′29.85″N, 18°5′39.04″W, 60 m, *Lupinus polymorpha* (garden); IS26: worker, 17.VI.2014, Svinafellsjokul, 64°0′29.92″N, 16°52′46.07″W, 135 m, *Lupinus nootkatensis*.

GBIF and AMNH records

30 GBIF and one AMNH records are available. — AMNH_BEE00163546: worker, Blaskogabyggo, Árnessýsla, Pingvellir National Park, 64°15′28.98″N, 21°7′30.00″W, 24.VII.1971, R. G. Goelet, *Bombus jonellus* (Kirby, 1802); GBIF335156422, GBIF335156423: Syntypes, Skagafjord?, Steineke, *Bombus (Pyrobombus) jonellus subborealis (atrocorbiculosus)* Vogt, 1911; GBIF335156424, GBIF335156425, GBIF335156426, GBIF335156428: Syntypes, Skagafjord?, 30.VII.1896, W. Lundbeck, *Bombus (Pyrobombus) jonellus subborealis (atrocorbiculosus)* Vogt, 1911; GBIF335156427: Syntype, Skagafjord?, 1.VIII.1881, W. Lundbeck, *Bombus (Pyrobombus) jonellus subborealis (atrocorbiculosus)* Vogt, 1911; GBIF335156429, GBIF335156430: Syntypes, Hallormsstadhur, 9.VIII.1907, *Bombus jonellus subborealis (atrocorbiculosus)* Vogt, 1911; GBIF335156431, GBIF335156432, GBIF335156433, GBIF335156434, GBIF335156435: Syntypes, Akureyri, *Bombus (Pyrobombus) jonellus subborealis (atrocorbiculosus)* Vogt, 1911; GBIF335156437, GBIF335156438: Syntypes, *Bombus (Pyrobombus) jonellus subborealis (atrocorbiculosus)* Vogt, 1911; GBIF335156439: Syntype, Steineke, *Bombus (Pyrobombus) jonellus subborealis (atrocorbiculosus)* Vogt, 1911; GBIF335156860: Syntype, *Bombus (Pyrobombus) jonellus subborealis (sparreschneiderianus)* Vogt, 1911; MZLU.Ent.247626: 7 specimens, *Bombus jonellus* (Kirby, 1802); RMNH.INS.592439: worker, 1.I.1870, Bottema, *Bombus (Bombus) hortorum* (Linnaeus, 1758); RMNH.INS.598901: worker, 1.I.1870, Bottema, *Bombus (Bombus) terrestris* (Linnaeus, 1758); RMNH.INS.604974: worker, Skaftafell, 19.VII.1980, *Bombus jonellus* (Kirby, 1802); RMNH.INS.607337: *Bombus (Pratobombus) jonellus* (Kirby, 1802); RMNH.INS.612347: Skaftafell, 19.VII.1980, *Bombus jonellus* (Kirby, 1802); ZMA.INS.764078, ZMA.INS.774622: workers, Morsárdalur (Morsaadalen), 4.VIII.1908, *Bombus (Pyrobombus) jonellus* subsp. *subborealis* Richards, 1933; ZMA.INS.947791: Syntype, female, 9.VIII.1908, *Bombus (Pyrobombus) jonellus subborealis* f. *sparreschneiderianus* Vogt, 1911; ZMA.INS.947807, ZMA.INS.947811: Syntypes, workers, *Bombus (Pyrobombus) jonellus subborealis* f. *atrocorbiculosus* Vogt, 1911.

Remark: Concerning '*atrocorbiculosus*' and '*sparreschneiderianus*' see section 'Status'. The determinations of RMNH.INS.592439 (*B. hortorum*) and RMNH.INS.598901 (*B. terrestris*) are not correct, both specimens can be classified as *B. jonellus*. The syntype status of the specimens of the Zoological Museum Amsterdam (ZMA, included also in GBIF) is related to the collection of Vogt (1911) concerning the classification in '*atrocorbiculosus*' and '*sparreschneiderianus*'.

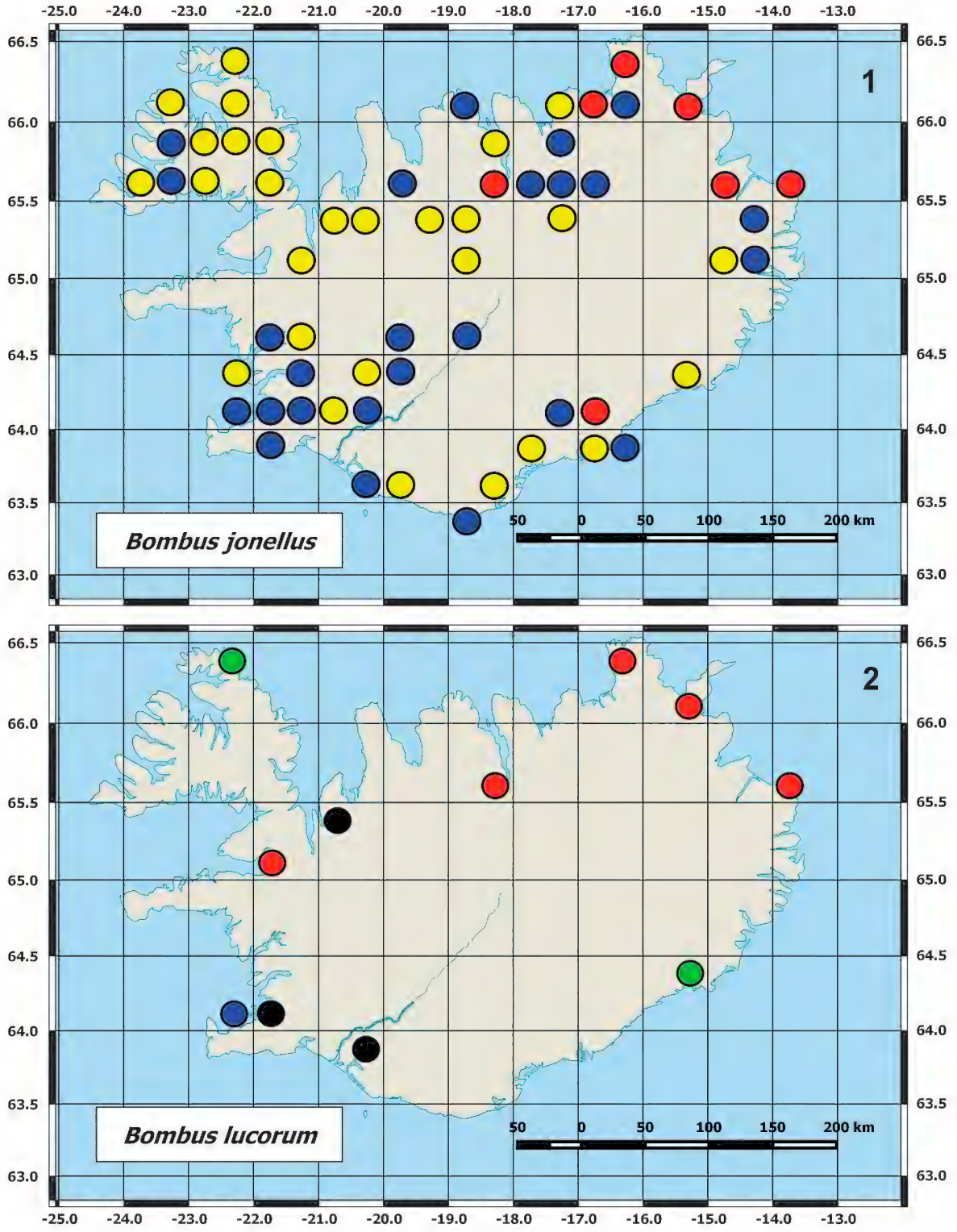
Body length

The mean body length in queens was 17.11 mm (SD ± 0.67) (N = 8), in workers 11.68 mm (SD ± 2.33) (N = 4).

Distribution and habitat selection

Fig. 1 documents the distribution of *Bombus jonellus* in Iceland (Prŷs-Jones et al. 1981: 77 grid records before 1960, 35 grid records between 1960 and 1980, 12 grid records added from 2014).

B. jonellus is widespread in Iceland and occurs as a dominant *Bombus* species in nearly all habitat types with entomophilous plant species from the glacier forefield to the coastal ecosystems. In the highlands specimens are not so frequent. Today the number of *B. jonellus* detections in 25 × 25 km grids of Iceland amount to 58 grids. Iceland covers 197 grids, but about 10 % are covered by ice



Figs. 1–2. Distribution of *Bombus* spp. in Iceland. – **1**. *B. jonellus*. **2**. *B. lucorum*. – Yellow circles: grids with records before 1960 (Prŷs-Jones et al. 1981), blue circles: records between 1960 and 1980 (Prŷs-Jones et al. 1981), green circles: records of Ólafsson (2008, 2009), red circles: own data 2014, black circles: 3 records of GBIF 2014. Older detections were replaced by more recent ones.

Figs. 3–4. *Bombus lucorum* queens visiting flowers in Iceland. – **3**. *Salix lanata* (Bakkagerði, Höfn, 4.VI.2014). **4**. *Lupinus nootkatensis* (Húsavik, Laxá, 8.VI.2014). – Photos: A. Schwabe.

and snow. If we suppose that 177 grids are not ice- or permanently snow-covered, until today *B. jonellus* has been observed in 58 grids (33 %).

Phenology and flower visits

From June 3 to June 18 queens and workers could be observed to prefer *Salix* species: *S. callicarpaea*, *S. lanata*, *S. phylicifolia*. Further plant species visited by *B. jonellus* are *Taraxacum officinale* agg. and two introduced *Lupinus* species: *L. nootkatensis* and *Lupinus* hybrid (garden). At this time more queens than workers could be observed; that means that the foundation of colonies was not advanced.

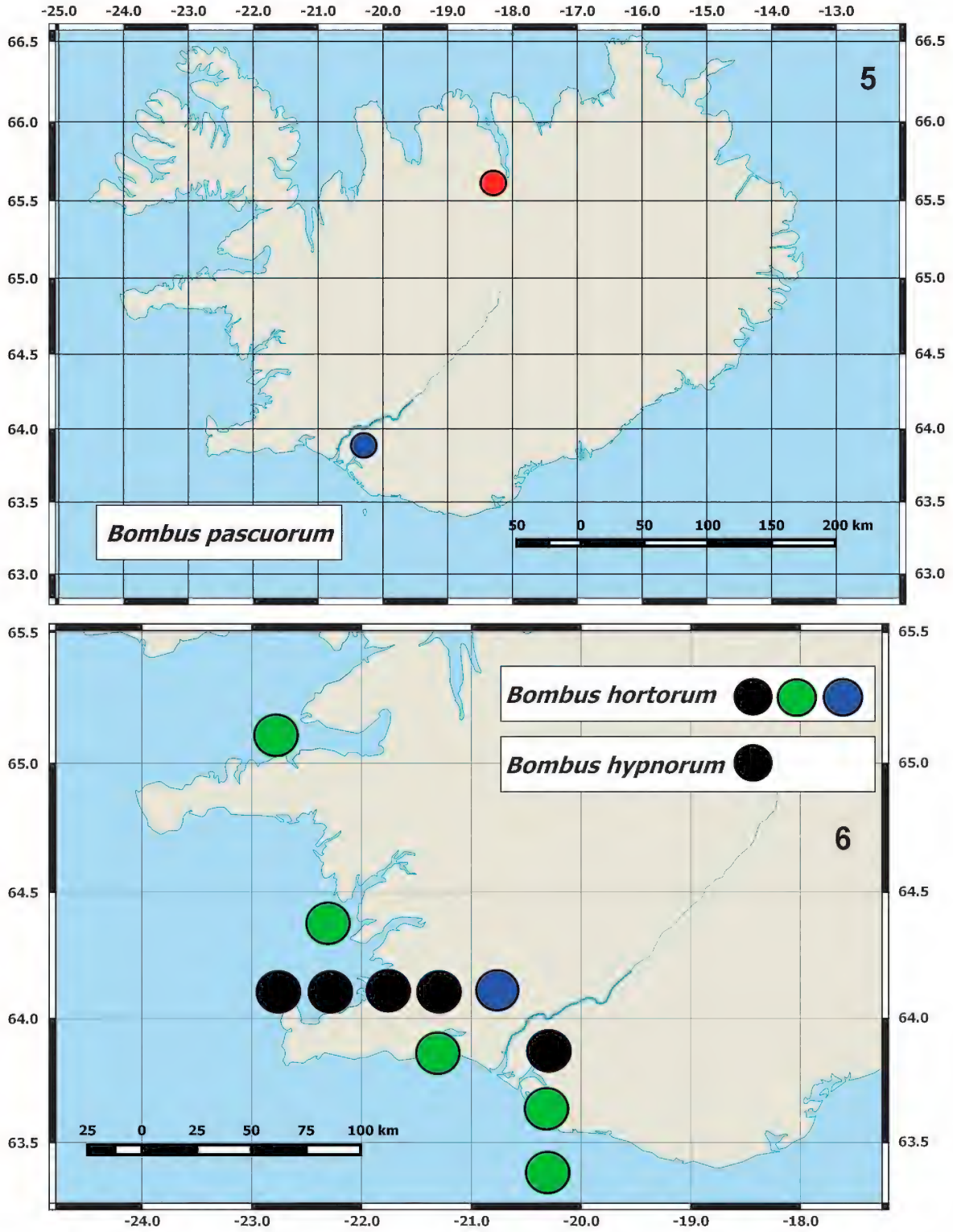
Prŷs-Jones et al. (1981) documented the plant species spectrum visited by *B. jonellus* and emphasise that in June primarily *Salix* species are available. Among the most important foraging plants other than *Salix* species are: *Geranium sylvaticum*, *Vaccinium uliginosum*, *V. myrtillus*, *Calluna vulgaris*, *Thymus praecox* subsp. *arcticus*, *Trifolium repens* and *Arctostaphylus uva-ursi*. Fairly important are: *Rhinanthus minor*, *Dryas octopetala*, *Geum rivale*, *Leontodon autumnalis* and *Potentilla palustris*.

Ecological characterisation

Subspecies as geographic taxa are characterised by adaptations evolved under the special regional environmental conditions. In the following for a comparison only the ecological characters of the subspecies *subborealis* should be considered. In Norway *B. j. subborealis* is widely distributed from the south to the Arctic coast with a preference for heather (*Calluna*) and adjacent meadows from coast to the alpine region (Løken 1973). For eastern Scandinavia *B. jonellus* prefers biotopes with boreal character (Pekkarinen et al. 1981). In the Abisco region (Norway) nesting sites were found in subalpine heath birch forest habitats (Svensson & Lundberg 1977). Cultivated areas are avoided (Løken 1973).

In the terminology of Pittioni & Schmidt (1942) *B. jonellus* can be classified as stenoecious-hylophilous (small ecological amplitude and preferring humid regions).

On Solovetskii Island (White Sea) Bolotov et al. (2013) studied the population dynamics of *B. jonellus*, *B. lucorum*, *B. pascuorum*, *B. pratorum*, *B. hypnorum* and some other species under different environmental conditions. Changes in species abundance reflected changes



Figs. 5–6. Distribution of *Bombus* spp. in Iceland. – **5**. *B. pascuorum* ssp. *sparreanus*. Blue circle: grid with records of Ice-News (2010) and of Ólafsson (2010), red circle: own data 2014 including 3 GBIF records. **6**. *B. hortorum* in Southwestern Iceland. Blue circle: grid with records between 1960 and 1980 (Prŷs-Jones et al. 1981); green circles: grids with records of Ólafsson (2013a); *B. hortorum* and *B. hypnorum*: black circles: grids with records of Ólafsson (2010, 2013b). Older detections were replaced by more recent ones.

in weather and climate conditions. The superdominance of *B. jonellus* was positively correlated with a high frequency of winter-thaws and negatively correlated with summer heat supply (Bolotov et al. 2013). Thaws from January to March were unfavourable for bumblebees and resulted in high mortality rates. But in contrast to other species *B. jonellus* is better adapted to these unfavourable conditions and has the competitive advantage of early nest founding, small colony size and rapid colony development, which allows two generations in some years (Meidell 1968, Douglas 1973). Under winter-thaw conditions and reduced population sizes of the other bumblebee species *B. jonellus* benefits from free resources. The same situation exists in Iceland. Frost in Iceland is frequent, but thaws are common and a peculiarity of Icelandic weather (Einarsson 1984). High population densities in *B. jonellus* are present in cold summer seasons (Bolotov et al. 2013). *B. jonellus* colonises successfully the Subarctic (forest tundra, hypoarctic tundra) with nesting preferences along sea coast and in river deltas within the drier conditions of well-drained sandy soils (Bolotov et al. 2013).

3.2 *Bombus (Bombus) lucorum* (Linnaeus, 1761)

Observed specimens

Eight queens and two workers were detected. — IS1: queen, 4.VI.2014, east of Borgarfjörður, 65°30′56.20″N, 13°47′33.00″W, 5 m, *Salix lanata*; IS7: queen, 6.VI.2014, Porshöfn, 66°11′54.88″N, 15°19′41.87″W, 9 m, *Salix lanata*; IS8: worker, 6.VI.2014, 66°11′54.88″N, 15°19′41.87″W, 9 m, *Salix lanata*; IS9: queen, 7.VI.2014, Snartastaðakirkja, Kópasker, 66°17′43.62″N, 16°25′29.77″W, 12 m, *Salix lanata*; IS10: queen, 7.VI.2014, Snartastaðakirkja, Kópasker, 66°17′43.62″N, 16°25′29.77″W, 12 m, *Salix lanata*; IS11: queen, 7.VI.2014, Snartastaðakirkja, Kópasker, 66°17′43.62″N, 16°25′29.77″W, 12 m, *Salix lanata*; IS14: queen, 7.VI.2014, Snartastaðakirkja, Kópasker, 66°17′43.62″N, 16°25′29.77″W, 12 m, *Salix phylicifolia*; IS15: queen, 7.VI.2014, Snartastaðakirkja, Kópasker, 66°17′43.62″N, 16°25′29.77″W, 12 m, *Lupinus nootkatensis*; IS23: worker, 9.VI.2014, Akureyri, 65°40′29.85″N, 18°5′39.04″W, 60 m, *Corydalis solida*; IS25: queen, 10.VI.2014, Saelingsdal, 65°14′52.30″N, 21°48′9.92″W, 92 m.

GBIF records

Four GBIF records are available. — GBIF1038537544: Gauksmyrartjörn, 65°20′48.71″N, 20°48′28.71″W, 12.VII.2014, *Bombus lucorum* (L.); GBIF1038538694: Reykjavík, Fossvogscemetery, 64°07′21.40″N, 21°54′43.55″W, 6.VII.2014, *Bombus lucorum* (L.); http://www.inaturalist.org/observations/744552: Hvolsvöllur, 63°45′7.57″N, 20°13′14.04″W, 19.VI.2014, *Bombus lucorum* (L.); MZLU.ENT.225391: Iceland, 18.X.2011, *Bombus lucorum* (Linnaeus, 1761).

Body length

The mean body length in queens was 20.90 mm (SD ± 1.82) (N = 8), in workers 12.30 mm (SD ± 2.69) (N = 2).

Distribution

Fig. 2 documents the distribution of *B. lucorum* in Iceland (4 grid records between 1960 and 1980, 7 grid records added from 2014). Today the number of detections in 25 × 25 km grids of Iceland amounts to 9 grids (5 %). It is remarkable that *B. lucorum* has expanded the distribution area not only to the whole north and northeast but also occurs in the southern parts of Iceland. Concerning introduced *Bombus* species *B. lucorum* shows the largest distribution and seems best adapted to the environmental conditions.

Phenology and flower visits

From June 4 to June 10 queens could be observed to prefer *Salix* species: *S. lanata* (Fig. 3) and *S. phyllicifolia*, although they also visited *Lupinus nootkatensis* (Fig. 4). Workers could be detected on *S. lanata* and *Corydalis solida*. At this time, more queens than workers could be observed; that means that the foundation of colonies was not advanced. In contrast to all other species *B. lucorum* competes in flower visiting exclusively with *B. jonellus*.

Introduction history

The first detection was in June 1979 in the region of Reykjavík (Heiðmörk, Reykjavík), in 1980 in Hafnarfjörður. The introduction seems not to have been intended.

Ecological characterisation

In Norway *B. lucorum* is abundantly distributed, but only occasionally observed in alpine regions (Løken 1973). In Scandinavia the preferred biotopes are e. g. habitats rich in *Salix*, meadows, gardens, orchards, *Calluna*- and *Vaccinium*-heath (Løken 1973). In the terminology of Pittioni & Schmidt (1942) *B. lucorum* can be classified as euryoecious-hylophilous (broader ecological amplitude with preference in humid regions). In contrast to *B. terrestris* the colonies are not so rich in individuals and the diapause is longer, therefore this species is not domesticable.

Bolotov et al. (2013) has shown that in contrast to *B. jonellus*, in the course of overwintering the abundance of *B. lucorum* is negatively influenced by thaws from October to January and positively correlated with the thickness of the snow cover and with dry weather conditions in summer. The snow cover is largest in northern and northeastern Iceland during December and through March (Einarsson 1984).

B. lucorum has one of the shortest tongue lengths in North European *Bombus* species, and therefore nectar robbing by biting a hole in the tube is a special resource strategy (Pekkarinen 1979, Teräs 1985). *B. lucorum* is very competitive in flower utilisation; this is shown in contrast to *B. hypnorum* e. g. by Teräs (1985).

It is remarkable that both *B. lucorum* and *B. pratorum* (Linnaeus, 1761) have recently established themselves on the Faroe Islands in 2007 (Madsen & Jensen 2011, Jensen & Madsen 2013). Both species were probably introduced via ship transport and both live in settlements with gardens. Only one bumblebee specimen had previously been reported from the Faroe Islands, but with doubtful provenance: *Bombus lapponicus* (Fabricius, 1793), see Madsen & Jensen (2011).

3.3 *Bombus (Thoracobombus) pascuorum sparreanus* (Løken, 1973)

Status

B. pascuorum (Scopoli, 1763) exhibits a large diversity after the last taxonomic revision, three allopatric and 21 parapatric subspecies (Lecocq et al. 2015). The introduced species can be classified as *B. p. sparreanus* (Løken, 1973) from central Fennoscandia (distribution from the west coast of Norway across the mountains eastwards throughout the conifer forest to the Gulf of Bothnia). This subspecies occurs also in Finland except Lapland (see fig. 2 in Lecocq et al. 2015).

Observed specimens

One queen and three workers were detected. — IS18: queen, 9.VI.2014, Akureyri, 65°40′29.85″N, 18°5′39.04″W, 60 m, *Lamium maculatum* (garden); IS20: worker, 9.VI.2014, Akureyri, 65°40′29.85″N, 18°5′39.04″W, 60 m, *Lupinus nootkatensis*; IS21: worker, 9.VI.2014, Akureyri, 65°40′29.85″N, 18°5′39.04″W, 60 m, *Vicia sepium* (garden); IS22: worker, 9.VI.2014, Akureyri, 65°40′29.85″N, 18°5′39.04″W, 60 m, *Vicia sepium* (garden).

Body length

The mean body length in queens was 17.5 mm (N = 1), in workers 10.9 mm (SD ± 0.61) (N = 3).

Distribution

Fig. 5 documents the distribution in Iceland (2 grid records). The introduction (two colonisation events?) seems not intended. *B. pascuorum* avoids colder regions and is absent from most of all Arctic islands (Orkney, Shetland Faroe Islands).

Flower visits

Flower visits of a queen on *Lamium maculatum* and workers on *Lupinus nootkatensis* and *Vicium sepium* could be observed by the author.

Ecological characterisation

Bombus pascuorum is a highly polytypic taxon (Lecocq et al. 2015). The origin of the documented introduced specimens is Norway. Bolotov et al. (2013) has shown that in the course of overwintering the abundance is negatively influenced by thaws from January to March. It is not clear to which subspecies the results of Bolotov et al. (2013) can be referred: *Bombus p. smithianus* or *B. p. sparreanus* (the authors had not differentiated to subspecies level). *B. pascuorum* can be classified as euryoecious-hylophilous (Pittioni & Schmidt 1942).

3.4 *Bombus (Megabombus) hortorum* (Linnaeus, 1761)

Distribution

Fig. 6 documents the distribution in Iceland (12 grid records; Prŷs-Jones et al. 1981; further observations according Ólafsson 2009, 2010). The first detection was in 1959 in Reykjavík, Heiðmörk (Prŷs-Jones et al. 1981). It seems that the restriction to south-west Iceland has remained until today. Anthropogenic influences (gardening) promote this long-tongued bumblebee species.

Ecological characterisation

B. hortorum is distributed in the entire Fennoscandia from the southern coast northwards, from the sea level to the subalpine/alpine zone (Løken 1973). In Fennoscandia the habitats enclose gardens, orchards, fields with Fabaceae, and sites of many flowers with deep corolla tubes (e. g. *Aconitum*, *Galeopsis*, *Vicia*). Anthropogenic influences (gardening) promote this long-tongued bumblebee species. *B. hortorum* can be classified as euryoecious-hylophilous (Pittioni & Schmidt 1942).

3.5 *Bombus (Pyrobombus) hypnorum* (Linnaeus, 1758)

Distribution

Fig. 6 documents the distribution in Iceland (5 grid records). The introduction (first observed in 2008) seems not intended.

Ecological characterisation

B. hypnorum is widely distributed throughout Norway from the sea level to the subalpine region, and in the north concentrated to conifer forests. The natural nesting sites are cavities in trees (Anasiewicz 1971). Preferred habitats are meadows, gardens, orchards, road sites and pastures, but primarily *B. hypnorum* is a Siberian fauna element of the taiga region (Løken 1973) (according Reinig 1965: sub-boreal taiga element). *B. hypnorum* can be classified as euryoecious-hylophilous (Pittioni & Schmidt 1942). Williams (1991) has shown that *B. hypnorum* is associated with the cool temperate forest zone in the north and the upper montane forests in the south, and Løken (1973) demonstrated a stronger preference for

areas inhabited by man. It was also shown by SVENSSON & LUNDBERG (1977) that the distribution of *B. hypnorum* in Fennoscandia is positively influenced by man-made habitats and sites in the neighbourhood of villages (see also POSTNER 1951, WAGNER 1971). This is due to the specialised nesting behaviour. The nests are generally established aboveground in tree hollows, abandoned swallow nests, bird boxes in trees, or house walls (LØKEN 1973).

BOLOTOV et al. (2013) has shown that in the course of overwintering the abundance is negatively influenced by thaws from January to March.

Since one century *B. hypnorum* seems to have expanded to the west; e. g. increase in Belgium and Germany during the twentieth century probably as a result of increasing urbanisation (RASMONT 1988, 1989). *B. hypnorum* colonised England in 2001 (GOULSON & WILLIAMS 2001).

3.6 *Bombus (Bombus) terrestris* (Linnaeus, 1758)

Ecological characterisation

Bombus terrestris is imported to Iceland for tomato pollination in greenhouses. This species occurs in the north only in the southern part of Fennoscandia, sporadically observed in southern Norway, but widely distributed in southern Sweden, concentrated in coastal regions (LØKEN 1973). *B. terrestris* is a more continental species, preferring dryer and warmer habitats and producing large colonies. *B. terrestris* can be classified as a hypereuryoecious-intermediary species (PITTIONI & SCHMIDT 1942).

4 Bumblebees in Iceland: Summarising notes and aspects for the future

A consequence of social life of bumblebees is the long seasonal activity. Therefore the temperature plays an important role in their distribution. Normally the limits of *Bombus* distribution correlate with the isotherms of effective temperature sums (PEKKARINEN et al. 1981).

The climate of Iceland is characterised by large interdecadal variations of temperature which are synchronic to the Atlantic multidecadal oscillation. Over longer periods the climate has become warmer: in the last 200 years about 0.7 °C per century, in the last 100 years about 0.5 °C. From 1975 to 2008 Iceland has warmed by about 1.2 °C (about 0.35 °C per decade; global average trend about 0.2 °C per decade); see BJÖRNSSON & JÓNSSON (2009).

As a consequence of warming up, species react with extension. This phenomenon is not new. KAISILA (1962) demonstrated that the phases of extensions and abundances of Lepidoptera in Finland correspond precisely to the periods of warm summers in this century. Extensions of *B. sylvarum* and *B. subterraneus* in Finland are associated with the warming up of the climate (PEKKARINEN et al. 1981). *B. terrestris* has also extended its range northwards in Scandinavia (LØKEN 1973). *B. terrestris* and *B. lapidarius* colonised Northern Scotland (MACDONALD 2001) and the possible role of climate change was discussed (MACDONALD 2001). In 2014 *B. terrestris* was detected in Shetland (MACDONALD & HARVAY 2014), 2014 in Orkney (PRŶS-JONES & WILLIAMS 2015) and Fair Isle probably *B. magnus* (Vogt, 1911). All were introduced through human agency, in cargo, perhaps hibernating and probably by sea using ferry ships (PRŶS-JONES & WILLIAMS 2015).

The response of nature to recent climate change is complex (PARMESAN 2006). Species adapted to colder conditions will reduce their populations or in extreme will inevitably go extinct if there is no possibility to reach higher mountain regions or northern latitudes. This process can be accelerated if competitors adapted to higher temperatures interact (MENÉNDEZ 2007). In Iceland global warming effects may reduce *B. jonellus* populations adapted to cooler summer temperatures and promote those of introduced *Bombus* species with higher temperature preferences. *B. lucorum* may expand in many regions of Iceland far from settlements but also into cultivated and settlement areas.

A similar situation is observed in northern Britain (PLOWRIGHT et al. 1997, PLOWRIGHT & PLOWRIGHT 2009). The authors come to the conclusion that global warming effects are decisive. *B. muscorum* tolerate cold and damp weather conditions and gave evolutionary responses such as late phenology, large body size and dense body hairs. Under such weather conditions *B. pascuorum* is not able to compete. Under global warming *B. pascuorum* expanded northwards and – better adapted – provided the decline of *B. muscorum* suffering now under ecological disadvantages. The further development of *B. pascuorum* is also positively promoted by global warming effects (PLOWRIGHT et al. 1997, PLOWRIGHT & PLOWRIGHT 2009).

In Iceland *B. hortorum* is restricted to settlement areas with gardens (preferring long-tubed flowers). But *B. lucorum* may also compete with *B. hortorum*. *B. hypnorum* is also restricted to settlement areas, concerning special nesting behaviour.

B. terrestris seems not to be adapted to survive outside greenhouses in Iceland. There are no impacts of introduced *B. terrestris* as reported from Israel (DAFNI & SHMIDA 1996), Japan (DAFNI 1998), Tasmania (HINGSTON et al. 2002) or New Zealand (MACFARLANE & GURR 1995).

In Iceland the process of a species turnover in Hymenoptera Apoidea Anthophila is going on. The driving forces are two factors, which correlate among themselves: global warming and introduction of non-native species. The rate of change or the consequences, e. g. within the pollinator network, are unknown.

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Revisionary checklist of the southern African Osminiini (Lepidoptera: Sesiidae)

Daniel Bartsch

Abstract

A revisionary checklist of the southern African clearwing moths of the tribe Osminiini is presented. Redescriptions of the genera and species from the region are given wherever necessary. The two genera, *Erismatica* Meyrick, 1933 and *Pseudomelittia* Le Cerf, 1917, are placed in Osminiini for the first time. One new genus, *Halictina* **n. gen.**, as well as eight new species, *Cabomina ruthmuellerae* **n. sp.**, *C. flavivertex* **n. sp.**, *Aenigmina albiapex* **n. sp.**, *Noctusphecia kgalagadia* **n. sp.**, *N. rubra* **n. sp.**, *Homogyna nama* **n. sp.**, *H. dukei* **n. sp.**, and *H. xanthomelaena* **n. sp.** are described. The following new combinations are introduced: *Cabomina chalypsa* (Hampson, 1919) **n. comb.**; *C. hilariformis* (Walker, 1856) **n. comb.**; *C. leucopleura* (Hampson, 1919) **n. comb.**; *C. tiresa* (Druce, 1899) **n. comb.**; *Erismatica endopyra* (Hampson, 1910) **n. comb.**; *Halictina andraenipennis* (Walker, 1856) **n. comb.**; *Synanthedon elymais* (Druce, 1899) **n. comb.**; *S. xanthopasta* (Hampson, 1919) **n. comb.**; *S. tapeina* Hampson, 1919 **n. comb.**; *S. ochracea* (Walker, 1864) **n. comb.** and *S. cingulata* (Gaede, 1929) **n. comb.** Lectotypes of *Chamanthedon heliostoma* Meyrick, 1926 and *Paranthrene sanguipennis* Meyrick, 1926 are designated. *Erismatica erythropis* Meyrick, 1933 **n. syn.** is considered a new subjective junior synonym of *Erismatica endopyra* (Hampson, 1910). Bionomical data for some Afrotropical Osminiini species are given, which are the first observations on the life history of a member of the tribe.

K e y w o r d s : Descriptive taxonomy, new species, new genus, systematics, synonymy, bionomy.

Zusammenfassung

Eine revidierte Checkliste der Osminiini des südlichen Africa wird vorgestellt. Wo es notwendig erschien, werden Wiederbeschreibungen der aus der Region bekannten Gattungen und Arten gegeben. Erstmals zu den Osminiini gestellt werden die beiden Gattungen *Erismatica* Meyrick, 1933 und *Pseudomelittia* Le Cerf, 1917. Eine neue Gattung, *Halictina* **n. gen.**, sowie acht neue Arten, *Cabomina ruthmuellerae* **n. sp.**, *C. flavivertex* **n. sp.**, *Aenigmina albiapex* **n. sp.**, *Noctusphecia kgalagadia* **n. sp.**, *N. rubra* **n. sp.**, *Homogyna nama* **n. sp.**, *H. dukei* **n. sp.** und *H. xanthomelaena* **n. sp.** werden beschrieben. Die folgenden neuen Kombinationen werden vorgeschlagen: *Cabomina chalypsa* (Hampson, 1919) **n. comb.**; *C. hilariformis* (Walker, 1856) **n. comb.**; *C. leucopleura* (Hampson, 1919) **n. comb.**; *C. tiresa* (Druce, 1899) **n. comb.**; *Erismatica endopyra* (Hampson, 1910) **n. comb.**; *Halictina andraenipennis* (Walker, 1856) **n. comb.**; *Synanthedon elymais* (Druce, 1899) **n. comb.**; *S. xanthopasta* (Hampson, 1919) **n. comb.**; *S. tapeina* Hampson, 1919 **n. comb.**; *S. ochracea* (Walker, 1864) **n. comb.** und *S. cingulata* (Gaede, 1929) **n. comb.** *Erismatica erythropis* Meyrick, 1933 **n. syn.** wird als subjektives jüngeres Synonym zu *Erismatica endopyra* (Hampson, 1910) angesehen. Lectotypen von *Chamanthedon heliostoma* Meyrick, 1926 und *Paranthrene sanguipennis* Meyrick, 1926 werden festgelegt. Es werden bionomische Angaben zu einigen afrikanischen Arten der Osminiini mitgeteilt, diese sind zugleich die ersten Beobachtungen zur Lebensweise eines Angehörigen der Tribus.

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1 Introduction

The Osminiini are a small tribe of clearwing moths erected by Duckworth & Eichlin (1977) to accommodate the North American genera *Osminia* Le Cerf, 1917 and *Calasesia* Beutenmüller, 1899. Subsequently, several old world genera were placed in Osminiini, which currently comprise 16 genera with nearly 100 species. The highest diversity is recognized in the Oriental and Afrotropical regions (Pühringer & Kallies 2004) with a distinct hotspot in southern Africa, from where 25 species in seven genera are presently known. Nevertheless, the knowledge of the Afrotropical Osminiini is still fragmentary and results from a few, relatively current articles. Gorbunov & Arita (1998a) revised *Homogyna* Le Cerf, 1911 and *Aenigmina* Le Cerf, 1912 comprising six or four species, respectively, and together with the monotypic genus *Pyranthrene* Hampson, 1919 placed them in Osminiini. The same authors (1998b) revised *Chamanthedon* Le Cerf, 1916 from the Oriental Region in Osminiini and exclude all assigned African species as "incertae sedis". Kallies (2004) described *Osminia namibiana* from Namibia. Pühringer & Kallies (2004) transferred the Madagascan genus *Microsynanthedon* Viette, 1955 with three species to Osminiini. Freina published a series of papers on the Sesiidae fauna of Southern and Eastern Africa, several of them concern Osminiini. First, he described the new genus *Cabomina*, originally with three species, two of which were new to science (Freina 2008). This was followed by the descriptions of a fourth species of *Cabomina*, a second species of *Echidgnathia* Hampson, 1919 together with placement of this genus in Osminiini (Freina 2011a), and lastly a new genus and species, *Noctusphecia puchneri*, from Tanzania (Freina 2011b).

During the study of Sesiidae from southern Africa a further eight undescribed species were uncovered and six so far misplaced species were assigned to Osminiini. One species, described as *Melittia andraenipennis* by Walker (1856) and later placed in *Pseudomelittia* by Hampson (1919), was found to belong to a very distinct new genus, *Halictina* n. gen., within the Osminiini.

In this article I provide a revised checklist and a first comprehensive overview of the current 25 species of Osminiini, including the descriptions of new taxa, from southern Africa (Namibia, South Africa, Botswana, Zimbabwe and Mozambique south of Zambezi).

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2 Material and methods

Specimens were borrowed from and/or are deposited in the collections of the following institutes (acronyms used throughout the text): The Natural History Museum, London (BMNH), University Museum, Oxford (OXUM), Museum für Naturkunde an der Humboldt-Universität, Berlin (MNHB), National Museum of Namibia, Windhoek (NMNW), Staatliches Museum für Naturkunde, Stuttgart (SMNS), Zoologische Staatssammlung, München (ZSM), Ditsong National Museum of Natural History (former Transvaal Museum), Pretoria (TMSA), South African National Collection of Insects, Pretoria, (SANC), and the collections of Thomas Witt, Munich (CMWM), Douglas M. Kroon, Sasolburg (CDK), Steffen Schellhorn, Jena (CSS) and the author (CDB). All type specimens were photographically documented.

Several males were collected using various synthetic pheromones from PRI, Plant Research International, Wageningen, the Netherlands. Some specimens of both sexes were netted on flowers. Genitalia were dissected in the usual way: maceration of the abdomen in 10 % KOH, removing of the scales and cleaning in 70 % ethanol, those of females were stained with Chlorazol Black. They were stored in a mixture of 70 % ethanol and 30 % glycerine or embedded in Euparal on a hollow slide, males with opened valvae. Holo- and lectotypes have not been dissected. Morphological terminology follows Špatenka et al. (1999), and the terminology of wing venation follows Heppner & Duckworth (1981).

3 Systematics

Within the Afrotropical Osminiini two main groups of genera can be distinguished, both of which have the forewing veins R_1–R_3 well separated from each other and R_4+R_5 stalked. Osminiini "sensu stricto" are characterized by vein M_2 in the hindwing arising from or somewhat caudal to the centre of the crossvein and by veins M_3 and CuA_1 with a common stalk or rarely arising from a common point from cell tornus (see Eichlin & Duckworth 1988: 59, 61). Males of this group have simple setae covering the uncus and the valva, the gnathos is well developed, the tegumen and the uncus are rather flexibly linked together and the tuba analis with the subscaphium is exceedingly long (as in Fig. 61). The females of this group have the antrum short and well sclerotized and the ductus bursae long, gradually enlarged (as in Fig. 76). The following genera are considered belonging to this group: *Osminia*, *Aenigmina*, *Cabomina*, *Microsynanthedon*.

The second group is considerably different. It has the hindwing with the origin of vein M_2 from the costal half of the crossvein (somewhat similar to Sesiini and Cissuvorini) and the origin of vein CuA_1 more or less proximal from cell tornus (similar to Melittiini and Paranthrenini) (see Le Cerf 1911: 303). The genitalia of the second group are frequently strongly derived. The males have the setae of uncus and/or valva often specialized, thorn-like, bi- or multifurcate, the gnathos sometimes reduced, the tegumen and the uncus more or less seamlessly fused and the tuba analis relatively short (*Erismatica*, *Pseudomelittia*, *Halictina*, *Homogyna* and *Echidgnathia*, Figs. 68–75). The females often have a large, sometimes sclerotized antrum (*Homogyna*, *Echidgnathia*) (as in Fig. 79), and in *Homogyna* the papillae anales are small and strongly pointed (as in Fig. 80). Members of this group are: *Noctusphecia*, *Pyranthrene*, *Erismatica*, *Pseudomelittia*, *Halictina*, *Homogyna*, and *Echidgnathia*.

The lack of ventral ciliae of the male antenna was considered the most important synapomorphy of the Osminiini (Duckworth & Eichlin 1977, Eichlin & Duckworth 1988, Špatenka et al. 1999). However, males of almost all species that have been investigated during the course of this study and also those of the Palaearctic species *Sazonia fenusaeformis* (Herrich-Schäffer, 1852) have the antennae densely covered with rather short to medium-long, appressed and therefore barely visible ciliae (Figs. 85, 89). In rare cases the ciliae are markedly erect, e. g. in most species of *Cabomina* and *Pseudomelittia berlandi* Le Cerf, 1917 (Figs. 84, 88). Antennal ciliae are often restricted to the ventral side, but in some genera, such as *Aenigmina*, *Echidgnathia* and *Pseudomelittia*, are present on the entire surface. *Halictina andraenipennis* (Walker, 1856) has very scarce and short ciliae located on the ventral side of the clubbed antennal tip (Figs. 86, 87). The length of ciliae differs among species from about 0.02 mm in *H. andraenipennis*, 0.05–0.06 mm in *S. fenusaeformis* and *Echidgnathia* sp., 0.07–0.09 mm in *Pseudomelittia berlandi*, and 0.09–0.13 mm in *Cabomina* species. For comparison, the ciliae measure 0.06–0.09 mm in *Sesia bembeciformis* (Hübner, 1806) (Sesiini) and 0.09–0.13 mm in *Glossosphecia sherpa* (Bartsch, 2003) (Cissuvorini). Male antennae with appressed ciliae covering the entire surface are also known from *Anaudia felderi* Wallengren, 1863, *Microsesia nana* Bartsch, 2014 and *Coccophila pythes* (Druce, 1899), but considering structures of the venation and the male genitalia, the affiliation of these species with Sesiini is evident (Bartsch 2013, 2015). A multiple convergent development of these antennal types within the Sesiinae must be assumed.

Other diagnostic characters of the Osminiini that were mentioned by Duckworth & Eichlin (1977) vary widely when more species are taken into account. This includes the very long third segment of the labial palpus (usually half as long as second palpomere in African species), the strongly clavate antenna (long and narrow, only slightly clavate in *Aenigmina* and *Cabomina*, clubbed in *H. andraenipennis*), the somewhat degenerated hindwing anal veins (not reduced in *Pseudomelittia*). The same applies to characters of the genitalia of both sexes such as the absence of specialized setae of the valva and/or the uncus (setae of valva completely or partially bi- or multifurcate in *Homogyna*, *Pseudomelittia* and *Erismatica* Meyrick, 1933; setae of uncus thorn-like in *Echidgnathia vitrifasciata*), the presence of a gnathos in male (absent in several *Homogyna* species and in *Echidgnathia*) or the presence of a signum of the corpus bursae in female (absent in *Cabomina*, *Erismatica* and most *Homogyna* species).

The genitalic structure of Osminiini generally resembles closely that of Sesiini. This is with the exception of the extremely modified shape in *Homogyna* and *Echidgnathia*. For *Homogyna*, this was already noted by Gorbunov & Arita (1998b), who discuss an alternative placement of this genus in a separate tribe or the upgrading of Osminiini to a separate subfamily. However, based on the many commonalities within typical members of the Osminiini in the structure of the antennae, the wing venation and the setae of the valve (at least in the less specialized *Homogyna* species from southern Africa), I prefer the established placement of both *Homogyna* and *Echidgnathia* in Osminiini. Duckworth & Eichlin (1983) believed the North American Osminiini, all representatives of the typical group, to be a specialized offshoot of *Sesia* (Sesiini). However, this proposed relation could equally be reversed, with Sesiini as a specialized branch of Osminiini, or both being considered sister groups. Despite the here mentioned inconsistencies, which may argue for collapsing of Osminiini and Sesiini into a single tribe, as long as a well-justified higher system of the Sesiidae is still not available, I follow the traditional classification of the family and consider Osminiini distinct from Sesiini.

Several Afrotropical species including such from southern Africa have previously been assigned in the Osminiini genus *Chamanthedon* Le Cerf, 1916 (Hampson 1919, Vári et al. 2002). In a revision of this genus, Gorbunov & Arita (1998b) assumed that this genus is geographically restricted to south-east Asia and excluded all species from other world regions, including those of the Afrotropical region, and listed them as "incertae sedis". In the present study, the relationship of these species from the area of investigation and their placement within Osminiini is clarified. The remaining four species were found to belong to Synanthedonini and thus, are here provisionally transferred to *Synanthedon* Hübner, 1819. This includes the following species: *Synanthedon elymais* (Druce, 1899) **n. comb.**; *S. xanthopasta* (Hampson, 1919) **n. comb.**; *S. tapeina* Hampson, 1919 **n. comb.** and *S. ochracea* (Walker, 1864) **n. comb.**

4 Checklist of the Osminiini of southern Africa

Type species of genera are marked with an asterisk (*).

Cabomina Freina, 2008
- *Cabomina hilariformis* (Walker, 1856) **n. comb.** (*Aegeria*)
- *Cabomina monicae* Freina, 2008*
- *Cabomina tsomoana* Freina, 2011
- *Cabomina dracomontana* Freina, 2008
- *Cabomina ruthmuellerae* **n. sp.**
- *Cabomina heliostoma* (Meyrick 1926) (*Chamanthedon*)
- *Cabomina chalypsa* (Hampson, 1919) **n. comb.** (*Chamanthedon*)
- *Cabomina flavivertex* **n. sp.**
- *Cabomina leucopleura* (Hampson, 1919) **n. comb.** (*Chamanthedon*)
- *Cabomina tiresa* (Druce, 1899) **n. comb.** (*Aegeria*)

Osminia Le Cerf, 1917 [= *Signaphora* Engelhardt, 1946]
- *Osminia namibiana* Kallies, 2004

Aenigmina Le Cerf, 1912
- *Aenigmina critheis* (Druce, 1899)
- *Aenigmina albiapex* **n. sp.**

Noctusphecia Freina, 2011
- *Noctusphecia kgalagadia* **n. sp.**
- *Noctusphecia rubra* **n. sp.**

Erismatica Meyrick, 1933
- *Erismatica endopyra* (Hampson, 1910) **n. comb.** (*Tinthia*) [= *Erismatica erythropis* Meyrick, 1933* **n. syn.**]

Halictina **n. gen.**
- *Halictina andraenipennis* (Walker, 1856)* **n. comb.** (*Melittia*)

Homogyna Le Cerf, 1911
- *Homogyna nama* **n. sp.**
- *Homogyna ignivittata* Hampson, 1919
- *Homogyna sanguipennis* (Meyrick, 1926) (*Paranthrene*)
- *Homogyna xanthophora* (Hampson, 1910) (*Tinthia*)
- *Homogyna dukei* **n. sp.**
- *Homogyna xanthomelaena* **n. sp.**

Echidgnathia Hampson, 1919
- *Echidgnathia khomasana* Freina, 2011
- *Echidgnathia vitrifasciata* (Hampson, 1910)* (*Tinthia*)

5 Taxonomic account

5.1 *Cabomina* Freina, 2008

Type species: *Cabomina monicae* Freina, 2008, by original designation.

Freina (2008) described the genus *Cabomina* on the basis of a homogenous series of 35 males of the type species, *C. monicae*, a single male of *C. dracomontana* and two type specimens of *C. heliostoma* (Meyrick 1926). A fourth species, *C. tsomoana*, represented by four specimens, was added to the genus later (Freina 2011a). Freina (2008) also alludes to three species previously assigned to *Chamanthedon*, which might also belong to *Cabomina*. Two of them, *C. chalypsa* (Hampson, 1919) and *C. tiresa* (Druce, 1899), are here formally transferred to *Cabomina*. Two further species, *C. hilariformis* (Walker, 1856) and *C. leucopleura* (Hampson, 1919), which have been assigned to *Chamanthedon* are also moved to *Cabomina*.

Species differentiation within *Cabomina* is difficult. There are only minor consistent differences and the genitalia are very similar between species. Females of most species are still unknown. Richly yellow marked forms are found in *C. chalypsa* and *C. flavivertex*, but may also be present in other species.

Diagnosis

Cabomina can be defined as follows: (1) body predominantly glossy black, rarely yellowish marked, antenna often with white subapical spot, posterior margin of tergite 4 fine white or yellow; (2) haustellum (= proboscis) weakly sclerotized or reduced; (3) male antenna more or less distinctly ciliate; (4) uncus ventro-apically densely covered with setae; (5) valva elongate, distal half dorsally abruptly broadened, proximally with longitudinal medial crista; (6) phallus long and narrow with well developed coecum penis, vesica without distinct sclerotization; (7) female genitalia with short, sclerotized antrum, long and narrow ductus bursae, bursa copulatrix without signum.

The male genitalia were characterized and figured by Freina (2008, 2011a). They are homogenous within the genus, with only minor interspecific differences. Tegumen and uncus long and slender, flexibly linked together; gnathos long and slender, distally ventrad curved, strongly pointed; terminal third of uncus ventro-laterally densely covered with strong, simple setae; tuba analis extremely long with well sclerotized subscaphium; valva slender, dorso-distally abruptly broadened, distally more or less narrow and rounded, ventrally and distally densely covered with basad pointing, long, simple setae; vinculum and saccus short; phallus extremely long and slender; vesica without sclerotized structures.

The Madagascan genus *Microsynanthedon* displays a similar, but more elongate shape of the valva. It differs from *Cabomina* by the delicate and slender body, the completely reduced haustellum and the scarce setae of the uncus. The genus *Aenigmina* from eastern Africa is also superficially similar and closely related. It differs by the reduced haustellum; the much longer and slender uncus, which is sparsely covered with long simple setae, the typically ovoid valva with simple, basad pointing setae, and the longer saccus.

The structure of the female genitalia is here described on the basis of *Cabomina chalypsa* (Fig. 76) and *C. leucopleura* (Fig. 77). Papillae anales and segment 8 short; anterior and posterior pair of apophyses short, of equal length; ostium narrow, membranous, located somewhat caudally of sternite 7; antrum short, well sclerotized, slightly tapered; ductus bursae long and simple, gradually enlarged to form an oval bursa copulatrix, the latter without signum. The

structure of the female genitalia of *Osminia* is very similar, but differs by the well-developed signum of the bursa copulatrix. Females of *Aenigmina* are unknown.

Distribution

The genus is only known from southern Africa, Swaziland and southern Mozambique, but may also occur in Botswana and Zimbabwe. Nothing is known about the life history.

Key to the species of *Cabomina*

1 Forewing discal spot with small yellow spot, vein interspaces of apical area with a narrow yellow scale line; males with well developed transparent areas (Figs. 1–3) ..... ***C. hilariformis***
– Forewing opaque, rarely with indistinct external transparent area, discal spot without yellow spot (Figs. 4–28) **2**
2 Hindwing almost hyaline, distal margin narrow (Figs. 4–10) **3**
– Hindwing widely opaque or distal margin broad black (Figs. 11–28) **4**
3 Forewing black or blackish grey, discal spot indistinct (Figs. 4–6) ..... ***C. monicae***
– Forewing pale grey to dark brownish-grey, discal spot distinctly darker (Figs. 7–10) ..... ***C. tsomoana***
4 Fore coxa black (as in Fig. 14) **5**
– Fore coxa (partially) orange or white (as in Fig. 21) **6**
5 Fore leg black throughout, distal margin of hindwing reaching discal spot (Figs. 11–12) ..... ***C. dracomontana***
– Fore leg with femur and tibia ventrally orange-yellow, tarsus white, distal margin of hindwing clearly separated from discal spot (Figs. 13–15) ..... ***C. ruthmuellerae* n. sp.**
6 Abdomen dorsally without marking, or with yellow posterior margin of tergite 4 (Figs. 16–24) **7**
– Abdomen with white markings on tergites 4 and 6 (7 in male) (Figs. 25–28) **9**
7 Legs and abdominal tergite 4 with yellow cingulation, hindwing hyaline with broad black distal margin, hindwing discal spot small (Fig. 16) ..... ***C. heliostoma***
– Legs except for fore coxa pure black, or legs predominantly orange-yellow; abdomen black, laterally narrow orange (Figs. 17–24) **8**
8 Vertex black, hindwing proximally hyaline, distally semitransparent, discal spot always clearly visible (Figs. 18–22) ..... ***C. chalypsa***
– Vertex orange; hindwing nearly completely opaque, except for a small area near wing base; black form with indistinct discal spot (Figs. 23–24) ..... ***C. flavivertex* n. sp.**
9 Abdominal tergites 4 and 7 with white lateral spots (Figs. 25–27) ..... ***C. leucopleura***
– Abdominal tergites 4 and 7 with continuous white posterior margins ..... ***C. tiresa***

Cabomina hilariformis (Walker, 1856) **n. comb.**
(Figs. 1–3, 61)

Aegeria hilariformis Walker, 1856: 57.
Sesia hilariformis: Boisduval 1875: 454.
Chamanthedon hilariformis: Hampson 1919: 66; Dalla Torre & Strand 1925: 73; Gaede 1929: 523; Heppner & Duckworth 1981: 41.
Chamanthedon hilariformis (incertae sedis): Gorbunov & Arita 1998b: 19; Pühringer & Kallies 2004: 13.

Type material examined: Syntypes 1 ♂, 1 ♀, Port Natal [South Africa, Kwazulu-Natal, Durban] (OXUM).

Other material examined: 1 ♂ (Fig. 1), Port Natal (BMNH); 1 ♀ (Fig. 3), Natal, Durban (BMNH); 1 ♂ (Fig. 2), Natal, Durban, Umlalo, 27 Sep 1919, A. L. Bewis (TMSA); 1 ♂, East London, 20 Jan 1922 (TMSA gen.-prep. 3824, Fig. 61).

In the original description Walker refers to two specimens, a male and a female. Both are housed in the OXUM, images are available on the internet at http://oxford.university.museum/collect/index.htm. Both specimens are in poor condition. Missing body parts are the right antenna, some legs and the abdomen in the male; the antennae, some legs and the apex of the left forewing in the female. As I have no doubts about their conspecificity I refrain from designating a lectotype. *Cabomina hilariformis* is very distinct. Males of this species are the only representatives of the genus, which have forewings with a well developed transparent area. They are further characterized by the partly yellow discal spot and the fine yellowish lines between the veins of the apical area. Females are similar to the males, but have the forewings opaque, the white posterior margin of tergite 4 broader, and the hindwing distal margin broader and less clearly defined.

Cabomina monicae Freina, 2008
(Figs. 4–6, 62)

Type material examined: Holotype ♂ (Figs. 4, 5), South Africa, Western Cape Province, vic. Swellendam, Bontebok NP, 300 m, 30 Mar–13 Apr 1997, leg. J. J. de Freina (CMWM, later ZSM).

Other material examined: 2 ♂♂, same data as holotype (Freina gen.-prep. 2002/5, fec. Kallies; 2002/4 fec. Freina, Fig. 62) (CMWM, later ZSM); 2 ♂♂ (Fig. 6), South Africa, East London, Beacon Bay, 6 Apr 1982, leg. N. J. Duke (TMSA); 4 ♂♂, same locality, 16 Apr 1983; 1 ♂, East London, Buffalo Pass, 7 Dec 1983, leg. N. J. Duke, coll. Duke (TMSA).

Cabomina monicae is the south-western representative of the genus. It is here defined by the lack of orange-yellow markings, a fine white posterior margin of abdominal tergite 4, opaque forewings and nearly completely transparent hindwings with indistinct, small discal spot. Specimens from East London, which have not been examined by Freina, have an indistinct narrow external transparent area on the forewings. They are here considered *C. monicae* based on the comparable size (wingspan 12–17 mm) and coloration.

Cabomina monicae and the following species, *C. tsomoana*, are very similar and their conspecificity cannot be ruled out. Diagnostic characters mentioned in the original description of the latter (Freina 2011a) vary considerably

and overlap for both species. This includes the wingspan (13–19 mm in *C. monicae* and 11–15 mm in *C. tsomoana*), the similar forewing coloration (typical specimens of *C. monicae* and the darkest paratype of *C. tsomoana*) and the narrow external transparent area, which can be present in specimens of both species. Significant differences in the structures of the male genitalia could not be found (Freina 2011a). Females of both species are unknown.

Cabomina tsomoana Freina, 2011
(Figs. 7–10, 63, 84)

Type material examined: Holotype ♂ (Figs. 7, 8), Africa, Eastern Cape, Transkei, 6 km NW Tsomo, 900–1000 m, 9 Dec 2004, (CMWM, later ZSM).

Other material examined: 1 ♂ (Fig. 9), same data as holotype (CMWM, later ZSM); 6 ♂♂ (Fig. 10), South Africa, Drakensberge, vic. Clarens, Sunnyside Lodge, 28°32′10″S, 28°31′09″E, 1810 m, 21–23 Feb 2012, leg. Ströhle (1 ex. Bartsch gen.-prep. 2012-16, Fig. 63) (Antenna Fig. 84) (SMNS).

Cabomina tsomoana is very similar to the previously discussed *C. monicae* (see there for details). The holotype is the palest specimen of the type series, maybe representing a yellowish form of *C. monicae*. Newly discovered specimens from Clarens are generally somewhat darker, but the palest of them corresponds well with the darkest of the type series.

Cabomina dracomontana Freina, 2008
(Figs. 11, 12)

Type material examined: Holotype ♂ (Figs. 11, 12), South Africa, KwaZulu-Natal, S Drakensberg region, N Himeville, Vergelegen NR, 1900–2000 m, 28 Nov 1999, leg. J. J. de Freina (CMWM, later ZSM).

Cabomina dracomontana was described on the basis of a single, slightly descaled male with a wingspan of 18 mm and a body length of 8 mm. No further specimens are known. The type is predominantly black, including vertex, fore coxa and anal tuft; abdominal tergite 4 with narrow white posterior margin; labial palpus pale yellow with black terminal joint; and hindwing with very broad black, semitransparent distal margin. The coloration of the pericephalic scales is pale yellowish brown, not black as noted originally (cannot be seen in the figure). Freina (2008) assumed a close relationship with *C. heliostoma* and lists the following differential characters, which can be confirmed here: labial palpus including terminal palpomere and pericephalic scales pale yellowish brown (orange in *C. heliostoma*); hindwing less extensively transparent, with broader discal spot and less distinctly bordered margins; abdominal tergite 4 caudally with some white scales, legs black (posterior margin of abdominal tergite 4 and tibia and tarsus of all legs distally yellow in *C. heliostoma*). Other characters mentioned for *C. heliostoma*, such as the broader patagia and the reddish-brown forewing colour with whitish discal spot, are artificial, caused by the condition of the type specimen.

Cabomina ruthmuellerae **n. sp.**
(Figs. 13–15, 64)

Holotype ♂ (Figs. 13, 14): Swaziland, Manzini Distr., Ngwempisi Wilderness Area, valley north Khopho lodge, 26°40′40.6″S, 31°10′41.3″E, 800 m, at pheromone, 31 Jan 2015, leg. D. Bartsch (SMNS).

Paratypes (21): 2 ♂♂, same data as holotype (SMNS); 3 ♂♂, same locality, vic. Khopho lodge, 26°41′01.1″S, 31°10′31.2″E, 930 m, 30 Jan 2015, at pheromone, leg. D. Bartsch (SMNS); 1 ♂, Swaziland, Hhohho Distr., Malolotja NP, Malolotja campside, 26°08′39.0″S, 31°07′51.3″E, 1500 m, 28 Jan 2015, at pheromone, leg. D. Bartsch (SMNS); 7 ♂♂, same locality, view point above Komati river, 26°04′54.3″S, 31°07′54.7″E, 1150–1170 m, 29 Jan 2015, leg. D. Bartsch (SMNS); 1 ♂, South Africa, Limpopo Province, N Makopane, Farm Thabaphaswa, 1290 m, 24°03′12.09″S, 29°02′51.45″E, 25 Feb 2012, at pheromone, leg. D. Bartsch & J. Berg (SMNS); 1 ♂, Limpopo Province, NW Louis Trichardt, Hangklip Forest Reserve, ca. 1300 m, 23°00′S, 29°53′E, 01 Mar 2014, at pheromone, leg. S. Schellhorn (Bartsch gen.-prep. 2015-01, Fig. 64) (SMNS); 1 ♂, 1 ♀, same data (CSS); 2 ♂♂, same data, Hangklip Military Area, ca. 1600 m, 22°59.46′S, 29°53.02′E, 05 Mar 2014, at pheromone, leg. S. Schellhorn (CSS); 1 ♀ (Fig. 15), South Africa, TVL, [Limpopo Province, Legalameetse] the Downs, Mar 1986 (SANC); 1 ♀, Bronkhorstspruit Distr., Renosterpoort, 17 Feb 1975, Potgieter & Scoble (TMSA).

Etymology

This species is dedicated to Ruth Müller, Pretoria, who has kindly organized several joint collecting trips and guided access to many interesting localities.

Description

Male. Wingspan 14–20 mm, forewing length 6–9 mm, antennal length 5.5–7.5 mm, body length 8–10 mm. – Head: Labial palpus orange, terminal palpomere with some black scales; frons black with blue gloss; vertex shiny black with narrow orange spot between antenna and ocellus and some orange scales occipitally; pericephalic scales orange; antenna black. – Thorax: Black, particularly alive with bright greenish golden gloss. Legs black; fore leg with femur ventro-distally and tibia ventrally orange-yellow, tarsus ventrally yellowish white; mid and hind tarsus ventrally grey; tarsus of all legs distally with narrow white ring. Wings black; forewing opaque throughout; hindwing hyaline, distal margin and apex broad black, somewhat translucent, discal spot narrow, extending to

M_3; underside of forewing with basal half and costal margin yellow. – Abdomen: Black, alive with bright greenish golden gloss; posterior margin of abdominal tergite 4 narrow white; anal tuft medio-ventrally orange-yellow. Genitalia as described in the genus diagnosis (Fig. 64).

Female. Larger and more compact than the male. Antenna dorsally with distinct white subapical stripe; anal tuft black throughout; legs almost black, fore femur ventro-distally and fore tibia ventrally orange, tarsus of all legs distally with narrow white ring; wing underside completely black. Genitalia not examined.

Variation

Some minor differences are found in body size and in width and density of the scaling of the hindwing margins.

Diagnosis

C. ruthmuellerae n. sp. is most similar to *C. dracomontana*. It differs by the orange labial palpus (yellowish brown with black tip in *C. dracomontana*), the orange-yellow marked fore leg (black throughout in *C. dracomontana*), the narrower hindwing discal spot (broad, cuneiform in *C. dracomontana*), and the narrower, but significantly darker hindwing margin, which does not have contact with the discal spot. The male genitalia of both species are indistinguishable.

Cabomina heliostoma (Meyrick, 1926)
(Figs. 16, 17)

Chamanthedon heliostoma Meyrick, 1926: 267; Gaede 1929: 524; Heppner & Duckworth 1981: 41.
Chamanthedon heliostoma (incertae sedis): Gorbunov & Arita 1998b: 19; Pühringer & Kallies 2004: 13.
Cabomina heliostoma: Freina 2008: 164.

Type material examined: Lectotype (designated here) ♂ (Fig. 16), Natal, Weenen, Feb 1925, leg. H. P. Thomasset (BMNH). – Paralectotype ♀ (Fig. 17), same locality, Mar 1925 (BMNH).

Cabomina heliostoma was described on the basis of two specimens, a male and a female, which were separately captured in the same locality (Meyrick 1926). According to the original description, and in contrast to the assumption by Freina (2008), both specimens are primary types. The conspecificity is questionable, because both specimens show quite different coloration of head, legs and abdomen. The female is rather monochromatic with broad, black hindwing margin and may belong to *C. ruthmuellerae*. The male is well characterized by the largely hyaline hindwings and the orange-yellow marked head, abdominal tergite 4, anal tuft and legs, thus it is here selected as the lectotype.

Cabomina chalypsa (Hampson, 1919) **n. comb.**
(Figs. 18–22, 65, 76)

Chamanthedon chalypsa Hampson, 1919: 67; Dalla Torre & Strand 1925: 73; Gaede 1929: 524; Heppner & Duckworth 1981: 40.
Chamanthedon chalypsa (incertae sedis): Gorbunov & Arita 1998b: 19; Pühringer & Kallies 2004: 13.

Type material examined: Holotype ♂ (Fig. 18), South Africa, Natal, Durban (BMNH).

Other material examined: 6 ♂♂ (Fig. 19), 1 ♀ black form (Fig. 22), Swaziland, Mbabane, Sidwashini, 8 Dec 1990, leg. N. J. Duke; 5 ♂♂ yellow form (Figs. 20, 21), same data (♂, Bartsch gen.-prep. 2013-09, Fig. 65); 1 ♀ black form, same data, 16 Dec 1990 (Bartsch gen.-prep. 2013-11, Fig. 76); 1 ♂, black form, Swaziland Millen Falls, 24 Dec 1995, leg. N. J. Duke, coll. Duke (all TMSA).

The holotype belongs to the black form. It is mouldy and damaged, the tips of the antennae, the right labial palpus as well as the mid and hind legs are missing. It was not dissected and no further specimens from the type locality are known.

The following redescription is based on a series of 12 males and two females from Swaziland. The largest specimens of this series are similar in size to the holotype. The colour pattern of the dark forms and the shape of the translucent hindwing components in most forms are identical. But it cannot be ruled out, that these specimens represent a sibling species of *C. chalypsa*.

Redescription

Male. Wingspan 18–24 mm, forewing length 8–9 mm, antennal length 7.5–8.5 mm, body length 12–14 mm. – Head: Labial palpus dark orange-yellow, third palpomere black; frons and vertex glossy black; pericephalic scales dorsally orange, laterally black; antenna black. – Thorax: Black. Wings black, forewing underside with costal margin proximally orange; hindwing somewhat semi-transparent, proximally transparent, discal spot cuneiform; fringes of all wings dark grey. Legs black, fore coxa orange, tarsomeres of all legs distally with pale yellow narrow ring; spurs whitish. – Abdomen: Black, laterally with broad orange stripe, tergite 4 black throughout; anal tuft dorso-medially, laterally and ventrally orange. Genitalia generally as stated in the genus description, but uncus and valva rather long and narrow, the latter distally narrowly rounded and the medio-basal crista slightly raised (Fig. 65).

Female. Almost entirely black, except for the pale yellow first and second joint of the labial palpus, and the yellowish fore coxa. Females resembling the yellow form are unknown. Genitalia see genus description (Fig. 76).

Variation

Beside the typical black male form richly yellow marked ones exist. – Head: Labial palpus orange-yellow, first palpomere dorsally, second palpomere dorso-proximally whitish-yellow, third palpomere with some black scales ventrally; antenna black, scape ventrally orange, flagellum with white subapical patch dorsally. – Thorax: Black; tegula sparsely covered with whitish, hair-like scales; metathorax dorso-laterally with tufts of orange, hair-like scales. Forewing black, costal margin fine yellow, discal cell and area between discal spot, distal margin and veins R_4 and M_3 pale yellow, more or less densely admixed with black; hindwing pale yellow, semitransparent, proximal part transparent, discal spot and distal margin black; underside of all wings pale yellow, discal spots and distal margins black. Legs yellow; fore coxa densely mottled with black; coxa and femur of mid and hind leg black; spurs pale whitish-yellow.

The yellow forms vary in intensity and extension of the yellow wing markings, which in the forewings are more or less mottled with black and often somewhat reduced, in the smallest extreme to a small patch distal of the discal spot. The forewing underside can be black throughout. All forms vary in the extension of the transparent hindwing area.

Diagnosis

Cabomina chalypsa is one of the largest species of the genus, surpassed only by the following very similar *C. flavivertex*. Both species can be distinguished as follows: in *C. chalypsa* the vertex is nearly completely black with some orange scales occipitally rather than orange with small black medial patch in *C. flavivertex*; the hindwings are less densely scaled with extensive transparent area proximally, the coloration appears paler (only a very small hyaline stripe near wing base, coloration brighter in *C. flavivertex*). Black forms of *C. chalypsa* have the hindwing discal spot well developed (indistinct in *C. flavivertex*). Furthermore *C. chalypsa* has minutely longer and slender, more considerably pointed antennae and abdominal tergite 4 sometimes with indistinct yellow posterior margin. The male genitalia of *C. chalypsa* differ from that of *C. flavivertex* by the distinctly longer and narrower uncus and valva, the latter is apically more clearly pointed.

Smaller specimens of the dark forms of *C. chalypsa* with extensive transparent hindwings can be confused with *C. heliostoma* or *C. dracomontana*. These two species differ by the presence of a narrow, in *C. heliostoma* yellow, in *C. dracomontana* white posterior margin of abdominal tergite 4; furthermore *C. dracomontana* has the labial palpus pale yellow with black terminal palpomere (labial palpus orange in *C. chalypsa*); *C. heliostoma* has the legs ringed with yellow (legs completely black in *C. chalypsa*).

Cabomina flavivertex **n. sp.**
(Figs. 23, 24, 66)

Holotype ♂, yellow form (Fig. 23): "[South Africa] Pretoria, 11 Dec '15, W. Impey" "*Janseia callichroma* ♂ Type, Le Cerf, F. le Cerf det. 1921" "*Janseia callichroma* le Cerf. Type No. 2666" [listed by Fitzsimons et al. 1958, nomen nudum] (TMSA).

Paratypes (3): 1 ♂, yellow form Johannesburg, 5 Nov 1975, leg. M. Picker (TMSA); 1 ♂, black form (Fig. 24), South Africa, Transvaal, Irene, 8 Dec 1968, leg. C. K. Brain (Bartsch gen.-prep. 2013-08, Fig. 66) (TMSA); 1 ♂ yellow form, same locality, 4 Nov 2013 (CDK).

Etymology

Named after its typical bright yellow vertex, which is the best character to separate this species from its sibling species *Cabomina chalypsa*.

Description

Male. Wingspan 25–27 mm, forewing length 11–12 mm, antennal length 7.5–8.5 mm, body length 14–15 mm. – Head: Labial palpus orange-yellow; frons glossy black; vertex orange, occipitally mixed with black; pericephalic scales dorsally orange, laterally mottled with black; antenna black, scape ventrally orange, flagellum dorsally with white subapical patch. – Thorax: Black; prothorax laterally with some orange-yellow scales; tegula and dorso-lateral scale tufts of metathorax mottled with orange, hair-like scales. Wings almost completely opaque; forewing black, costal margin fine yellow, cell and area distally of discal spot, between distal margin and veins R_4 and M_3 yellow; hindwing bright yellow, with small transparent parts basally, discal spot and distal margin black; underside of both wings yellow, discal spots and distal margins black; fringes of all wings dark grey. Legs yellow, more or less densely mottled with black; mid and hind leg with coxa and femur laterally black, first tarsomere pale yellow, other tarsomeres black distally with narrow pale yellow ring; spurs of all legs pale yellow. – Abdomen: Laterally with orange stripe; tergite 4 with indistinct orange posterior margin; anal tuft dorso-medially, laterally and ventrally orange. Genitalia as stated in the genus description. Uncus and valva rather long and narrow, the latter distally narrowly rounded and the medio-basal crista slightly raised.

Female unknown.

Variation

As in the previous species bright yellow marked and predominantly black male forms were found. Black forms have head similar to the yellow form, but antennae pure black. Thorax with dorsum, legs and wings black, apart from yellow fore coxa and yellowish mottled costal margin and wing base of forewing underside; spurs whitish. Abdomen each segment with an orange patch laterally instead of an unbroken lateral stripe.

Diagnosis

Very similar in pattern and variation to *C. chalypsa*. For differentiation of this and other related species see diagnosis of *C. chalypsa* before.

Cabomina leucopleura (Hampson, 1919) **n. comb.**
(Figs. 25–27, 77)

Chamanthedon leucopleura Hampson, 1919: 67; Dalla Torre & Strand 1925: 73; Gaede 1929: 524; Heppner & Duckworth 1981: 41; Várі et al. 2002: 67.
Chamanthedon leucopleura (incertae sedis): Gorbunov & Arita 1998b: 282; Pühringer & Kallies 2004: 13.

Type material examined: Holotype ♀ (Fig. 25), South Africa, Transvaal, Johannesburg, 14 Jun 1901 (BMNH).

Other material examined: 1 ♀, Pretoria, 18 Apr 1914, leg. H. K. Munroe (Figs. 26, 27); 1 ♀, Gauteng, Faerie Glen NR, 5 Apr 1908, leg. U. Strauss; 1 ♀, Pretoria, 31 Mar 1918, leg. A. J. T. Janse (TMSA gen.-prep. No. 3825, Fig. 77) (all TMSA).

The type specimen lacks both antennae and almost all fringes of the wings. Three further female specimens from Pretoria are housed in the TMSA. The genitalia of one of them have been dissected by Várі and correspond perfectly with the genus diagnosis (Fig. 77). *C. leucopleura* can be easily distinguished from all congeners by the distinct white lateral spots of tergites 4 and 6. The hindwings have the distal margin very broad opaque and fused with the discal spot.

Cabomina tiresa (Druce, 1899) **n. comb.**
(Fig. 28)

Aegeria tiresa Druce, 1899: 202.
Chamanthedon tiresa: Hampson 1919: 68; Dalla Torre & Strand 1925: 73; Gaede 1929: 524; Heppner & Duckworth 1981: 41; Várі et al. 2002: 67.
Aenigmina tiresa: Gorbunov & Arita 1998b: 282; Pühringer & Kallies 2004: 13.

Type material examined: Syntype ♂ (Fig. 28), E. Africa, Delagoa Bay [Mozambique, Maputo Bay], leg. Monteiro (BMNH).

No clear information regarding the number of types is given in the original description. I found only a single, damaged syntype in the BMNH. The designation of a lectotype is unnecessary as long as no other syntype is known. The specimen lacks the left antenna; the abdomen was broken off and repaired with the underside uppermost. According to the original description tergites 4 and 7 are banded with white ("first and fourth" numbered from tip to base). This species appears rather similar to *C. leucopleura*, which has these tergites marked with white lateral spots. Accordingly, it is here transferred to *Cabomina*, but this must be considered provisionally as long as no further specimens are available and the genitalia cannot be examined.

5.2 *Osminia* Le Cerf, 1917

Type species: *Osminia ferruginea* Le Cerf, 1917, by original designation.

Literature: Le Cerf 1917: 327; Dalla Torre & Strand 1925: 118; Zukowsky 1936: 1243; Naumann 1971: 22; Heppner & Duckworth 1981: 28; Fletcher 1982: 115; Pühringer & Kallies 2004: 12.

Osminia has a predominantly New World distribution. Eleven species are known from Mexico and the southern parts of the United States (Eichlin 1998). In the Afrotropical Region it is only represented by *O. namibiana*, which occurs in the higher elevations of the Brandberg, Namibia (Kallies 2004). *Osminia* seems closely related to *Aenigmina* and *Cabomina*, which both exclusively occur in the Afrotropical region. This likely relationship is indicated by several common structures of the male genitalia, in particular the well developed gnathos, the rather unspecialized valva and the simple setae of uncus and valva and the nearly identical structure of the female genitalia. *Osminia* can be separated by its compact and strong body with rather short and strong legs, which both are longer and much more slender in the genera compared, most extreme in *Aenigmina*. The latter genus differs moreover by the reduced haustellum (well developed in *Osminia*). Males of *Osminia* have the gnathos apically more or less rounded, the gnathos and the tuba analis relatively short and broad; the uncus rather short and compact, densely clothed with fine setae; and the valva elongate, distally upward bent (gnathos long and slender, apically strongly pointed in *Aenigmina* and *Cabomina*; tuba analis with subscaphium extremely long, especially in *Cabomina*; uncus long and narrow, only sparsely covered with setae in *Aenigmina*; and valva ovoid in *Aenigmina*; elongate, dorso-distally abruptly broadened in *Cabomina*) (compare also Eichlin 1983). Females can be separated from those of *Cabomina* by the presence of a signum of the bursa copulatrix. The relationship of typical New World members of *Osminia* and *O. namibiana* as well as the two species of the Eurasian genus *Sazonia* described by Gorbunov & Arita (2001) remains unclear. This problem was briefly discussed by Kallies (2004).

Osminia namibiana Kallies, 2004
(Fig. 29)

Type material examined: Holotype ♂ (Fig. 29), Namibia, Brandberg, Wasserfallfläche, 1940 m, 22 Mar 2002 (MNHB, later NMNW).

Osminia namibiana is a small and inconspicuous species, but nevertheless unique within the Afrotropical Osminiini. Some superficially similar, small and greyish coloured species of Synanthedonini are distinguished by the tribe characters, such as the presence of obvious ciliae of the male antenna and a common stalk of hindwing veins M_3 and CuA_1, as well as by the very different structure of the genitalia.

5.3 *Aenigmina* Le Cerf, 1912

Type species: *Aenigmina aenea* Le Cerf, 1912, by monotypy.

Literature: Le Cerf 1912: 291; Hampson 1919: 71; Dalla Torre & Strand 1925: 108; Gaede 1929: 525; Naumann 1971: 11; Heppner & Duckworth 1981: 42; Fletcher 1982: 4; Gorbunov & Arita 1998b: 281; Pühringer & Kallies 2004: 13.

Aenigmina was revised by Gorbunov & Arita (1998b) rather recently. This genus is restricted to the Afrotropical region and currently comprises four species. Females are unknown. Two groups of species can be distinguished. The typical group, with *A. aenea* Le Cerf, 1912 and *A. latimargo* Le Cerf, 1912, both from Tanzania, have the body and the legs long and slender, black with an intense violet gloss; the antenna nearly as long as the forewing, apically pointed, brown with black tip; the hindwing margin broad, proximally clearly defined; the male genitalia with short tegumen and ovoid valva. The two species of the other group, *A. critheis* and *A. albiapex*, occur in the investigation area. They differ considerably from the typical group by the more compact, shorter and stronger, predominantly matt blackish coloured body and legs; the shorter and thicker, apically slightly truncated, entirely black antenna; the broad, but indistinctly bordered or narrow hindwing margins; the male genitalia (based on *A. albiapex*) with much longer tegumen and trapezoid shape of the valva.

Diagnosis

The definition of *Aenigmina* is difficult, due to the rather inhomogeneous appearance of the currently assigned species and the lack of females. Common characters are: (1) haustellum reduced; (2) male antenna with appressed ciliae; (3) uncus long and narrow, distally sparsely covered with simple setae; (4) valva ovoid or trapezoid, distally densely covered with basad pointing, simple setae; (5) phallus long and narrow with well developed coecum penis, vesica covered with numerous fine spinuli.

For differentiation from the superficially somewhat similar *Cabomina*, see diagnosis of this genus.

Aenigmina critheis (Druce, 1899) (Fig. 30)

Aegeria critheis Druce, 1899: 202.
Chamanthedon critheis: Hampson 1919: 68; Dalla Torre & Strand 1925: 73; Gaede 1929: 524; Heppner & Duckworth 1981: 40; Vári et al. 2002: 67.
Aenigmina critheis: Gorbunov & Arita 1998b: 282; Pühringer & Kallies 2004: 13.

Type material examined: Syntype ♂ (Fig. 30), E. Africa, Delagoa Bay [Mozambique, Maputo Bay], leg. Monteiro (BMNH).

Similar to other descriptions by Druce, no clear information concerning the number of types is given (Druce 1899). Only a single, well-preserved specimen was found in the BMNH. It is well characterized by its broad yellow fourth tergite of the abdomen, which is not present in any other species of Osminiini in southern Africa. I refrain from the designation of a lectotype as long as no other specimen becomes known.

Aenigmina albiapex **n. sp.** (Figs. 31, 32, 67)

Holotype ♂ (Figs. 31, 32): South Africa, Kwazulu-Natal, Sodwana, 1290 m, 8–9 Feb 1997, N. J. Duke leg. (TMSA).

Paratypes (2): 1 ♂ (Fig. 67), [South Africa], Pretoria, 5 Jan 1971, H. Townes leg. (TMSA); 1 ♂ Swaziland, Lubombo Distr., Mlawula NR, Mbuluzi Gorge, 26°10′09.0″S, 32°04′48.4″E, 150 m, 26 Jan 2015, D. Bartsch leg. (SMNS).

Etymology

Named after the unusual whitish stripe of the forewing apex.

Description

Male. Wingspan 15–18 mm, forewing length 6.5–8.0 mm, antennal length 4.5–5.5 mm, body length 9–12 mm. – Head: Labial palpus white, distal half of second as well as third palpomere dorsally brownish-yellow, third ventrally brownish-grey; frons smooth, dark silver-grey with light purple sheen; vertex smooth, black with some brownish-yellow scales between antenna and ocellus; pericephalic scales dorsally brownish-yellow, laterally white; antenna black. – Thorax: Dark grey to black; tegula posteriorly somewhat brownish-yellow; dorso-lateral scale tufts of metathorax white. Legs blackish grey; fore coxa externally white; fore tibia ventrally brownish-yellow; mid tibia dorsally and externally white; hind tibia mottled with some brownish-yellow scales, medially and distally with narrow white ring; tarsomeres of all legs distally with narrow white ring; spurs dark grey, reverse side whitish. Forewing blackish grey with well developed transparent areas, anterior short, external 4-partite, broadest costad with veins and margins yellow; apical area with

some yellow scales between median veins and a distinct, apically directed whitish-yellow spot between R_4 and R_5, common stalk of these veins very short; underside posterior of discal spot white. Hindwing hyaline, veins and margins dark grey, discal spot triangular, extending somewhat beyond M_2; fringes dark grey. – Abdomen: Dark grey to black, scarcely mottled with pale- to brownish-yellow scales, most densely laterally at segment 4; anal tuft black, medially and laterally yellow, outer side of valva distally pale yellow. Genitalia (Fig. 67) with tegumen long and narrow; gnathos rather short and thick; uncus long and narrow, ventro-laterally with some simple setae; valva trapezoid, dorso-distally triangularly broadened and apically narrowly rounded, distally and at ventral margin covered with basad pointed, simple setae; saccus long and narrow, rounded; phallus long and narrow with short coecum penis; vesica with numerous small cornuti.

Female unknown.

Diagnosis

The newly described species is easily recognizable due to the well-developed transparent areas and the eponymous whitish spot of the forewing apex. It is here described in *Aenigmina* based on the reduced haustellum, the wing venation and, more important, characters of the male genitalia. In contrast to the two typical species, *A. aenea* Le Cerf, 1912 and *A. latimargo* Le Cerf, 1912, *A. albiapex* appears more compact with stronger and shorter legs, shorter and somewhat thicker antenna, well-developed transparent areas, hyaline hindwings and absence of violet gloss of the body. The male genitalia differ by the distinctly longer tegumen and the trapezoid, not ovoid valva.

Habitat and behaviour

Nothing is known about the life history. The male from Swaziland was unspecifically attracted to various artificial pheromones during sunshine in the late morning hours. The habitat was a clearing in acacia bush that had been burned the previous year. A small, violet flowering species of Lamiaceae was the dominant herb.

5.4 *Noctusphecia* Freina, 2011

Type species: *Noctusphecia puchneri* Freina, 2011: 48, by original designation.

Noctusphecia was described on the basis of a single male from Mafinga, southern Tanzania. This specimen was captured at light around 22:00 p. m., giving reason to assume a nocturnal activity of this species, which is reflected in the generic name. Two additional, very different females that belong here, were found in the collection of the TMSA. They originate from Chanzi, Botswana, and from Penkridge, Eastern Highlands, Zimbabwe, and are described below.

Noctusphecia can be defined as follows: (1) coloration predominantly black, markings orange-red, scales almost smooth, rough at tibiae; (2) haustellum well developed; (3) labial palpus long and straight, first palpomere very short, second 1.5 times the length of third; (4) male antenna extraordinarily long, nearly as long as forewing, female antenna considerably shorter, reaching to the forewing discal spot; (5) forewing veins M_4 and M_5 coincident; hindwing vein M_2 arising from centre of cross vein, CuA_1 proximally of cell tornus; (6) male abdominal segment 8 caudally with short lateral protrusions.

The monotypic genus *Pyranthrene* Hampson, 1919 from Malawi is rather similar in external appearance. It differs from *Noctusphecia* by having the haustellum reduced, the labial palpus upturned to above the vertex, the male antenna distinctly shorter and the hind legs elongated. Females and genitalia structure of both sexes are unknown in *Pyranthrene*.

Noctusphecia kgalagadia **n. sp.**
(Figs. 33, 34)

Holotype ♀ (Figs. 33, 34): "Ghanzi, Betch. 40 miles sw" Botswana, Ghanzi district, 64 km SW Ghanzi, 1150 m, 10 Nov 1961, leg. Haecke & Prozesky (TMSA).

Etymology

This species is named after the Kgalagadi or Kalahari, a large, semiarid, sandy savanna in southern Africa.

Description

Female. Wingspan 21 mm, forewing length 9 mm, antennal length 5.5 mm, body length 11 mm. – Head: Labial palpus black, first and second palpomere ventrally brownish-red; frons black with blue-metallic sheen; vertex black, adjacent to ocellus orange-red; pericephalic scales orange-red; antenna black. – Thorax: Dark brownish-black, laterally between patagia and wing base a broad, orange-red stripe; patagia black with metallic gloss, laterally brownish-red; tegula posteriorly orange-red; mesothorax dorso-laterally with narrow, orange-red longitudinal stripes; scapular spot at wing base black; dorso-lateral scale tufts of metathorax weakly developed, admixed brownish-black and orange-red. Fore leg black; coxa white, lateral margin proximally as well as tibia latero-distally with small brownish-red spot. Mid and hind leg with coxa white and femur black; mid tibia orange-red, mottled with black, proximally and distally black; hind tibia orange-red, proximally black, medio-laterally white; mid and hind tarsomeres black, proximally broadly annulated with white; spurs of all legs mixed black and

brownish-red. Forewing dark greenish-grey with intensive metallic gloss; wing base, discal spot, costal and inner margin orange, the latter proximally mixed with white; hindwing and underside of both wings dark blackish-grey; fringes dark grey, forewing apex and tornus orange. – Abdomen: Orange-red; first segment brownish-black; tergites 2–6 with triangular, brownish-black medial spot anteriorly, largest on tergite 6; anal tuft weak, dorsally brownish-black, ventrally orange-red. Genitalia not examined.

Male unknown.

Diagnosis

In size and coloration *Noctusphecia kgalagadia* n. sp. resembles somewhat *N. puchneri*, the type species of the genus. It differs by having the vertex black (rusty-red in *N. puchneri*); the predominantly black thorax and patagia (thorax orange-brown; patagia rusty-red in *N. puchneri*); and the distinct orange-red forewing markings (only discal spot ochre-brown in *N. puchneri*). *Noctusphecia rubra* is much larger and well characterized by the basally orange-red hindwings.

Noctusphecia rubra **n. sp.**
(Figs. 35, 36)

Holotype ♀ (Figs. 35, 36): "Penkridge, 1.12.27 R. H. R. S." [Zimbabwe, Eastern Highlands, Penkridge, 1 Dec 1927, R. H. R. Stevenson] (TMSA). No paratypes.

Etymology

Latin ruber (= red).

Description

Female. Wingspan 30 mm, forewing length 13.5 mm, antennal length 8 mm, body length 16 mm. – Head: Labial palpus orange-red, second palpomere dorso-distally black, third palpomere black with some orange-red scales; frons dark greenish-grey with intensive metallic gloss; vertex orange-red, medially mottled with some black; pericephalic scales orange-red, laterally whitish; antenna black with white subapical spot. – Thorax: Dark brownish-black, between patagia and wing base with broad, orange-red lateral stripe; patagia brownish-red with metallic gloss, some black scales at posterior margin; posterior part of tegula, scapular spot at wing base, dorso-lateral stripes on mesothorax as well as dorso-lateral scale tufts of metathorax orange-red. Legs black; fore coxa medially and laterally brownish-red; mid and hind coxa distally white; fore and mid tibia with brownish-red lateral patch; hind tibia proximally black, medially orange-red, with narrow white ring between, distally black; first tarsomere of mid leg proximally white; first tarsomere of hind leg orange-red with some white scales proximally, disto-laterally black; spurs of all legs mixed white and orange-red. Forewing inclusive fringes dark greenish-grey with intensive metallic gloss; costal and inner margin at proximal half as well as discal spot finely orange-red; hindwing inclusive fringes dark blackish-grey, proximal of discal spot orange-red; underside of both wings similar, but proximal half of forewing orange-red. – Abdomen: Orange-red; first segment brownish-black, with orange-red patch laterally; tergites 2 and 3 dorsally with large black medial spot, largest on tergite 3; tergites 4 and 5 with some black scales medio-dorsally; sternites brownish-grey, laterally narrow orange-red; anal tuft orange-red, medially fine brownish-black, laterally and ventrally brownish-black. Genitalia not examined.

Male unknown.

Diagnosis

For differentiation see diagnosis of *N. kgalagadia* below.

5.5 *Erismatica* Meyrick, 1933

Type species: *Erismatica erythropis* Meyrick, 1933, by monotypy.

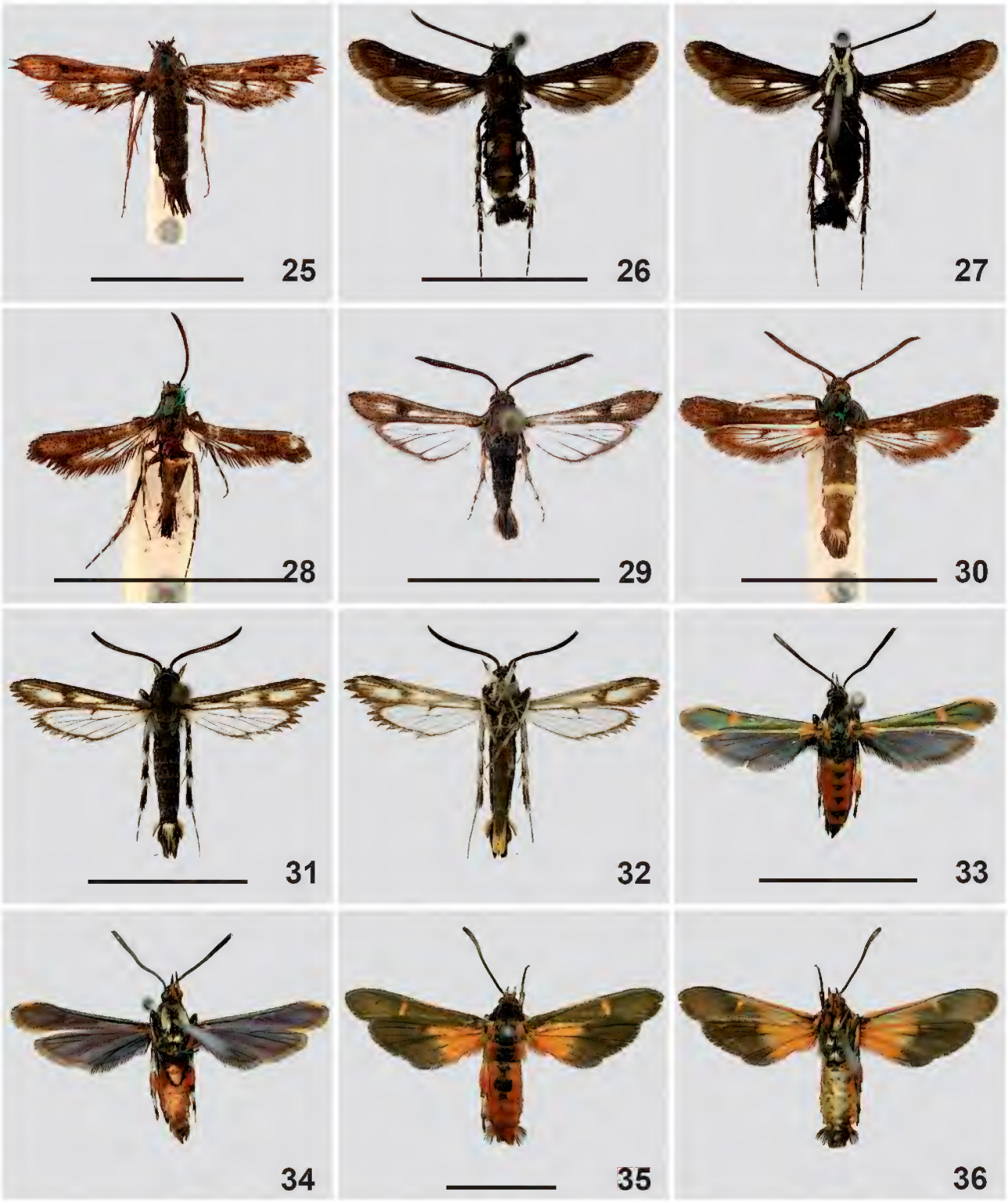
Literature: Meyrick 1933: 415; Heppner & Duckworth 1981: 43; Fletcher 1982: 61; Vári et al. 2002: 67; Pühringer & Kallies 2004: 44.

Redescription

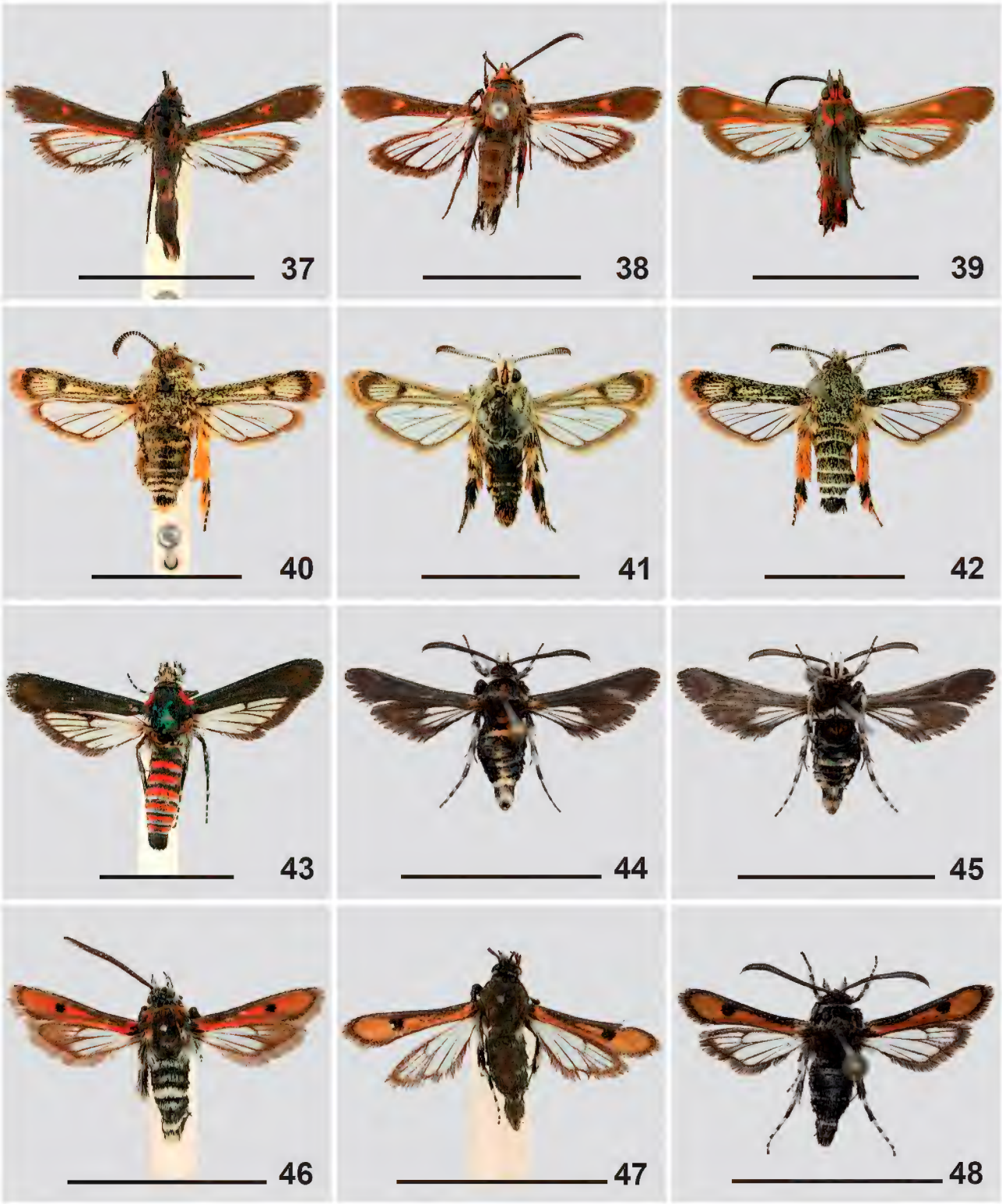
Head: Haustellum well developed and functional; labial palpus moderately upturned, smooth, without hair-like scales, second palpomere 1.5 times the length of other palpomeres; frons width about 1.5–1.8 times the diameter of a compound eye, smooth; scales of vertex rather short, smooth; antenna rather short and strong, slightly clavate, without rami, entirely covered with short, appressed ciliae. – Thorax: Vestiture smooth; dorsally sparsely mottled with hair-like scales; metathorax dorso-laterally with dense tufts of short, hair-like scales. Legs strong and rather short, smooth, mid and hind tibia dorso-laterally rough; all pairs of spurs strong with outer spur half as long as inner one. Wings short and rather broad; forewing opaque, discal spot highlighted in colour, scales somewhat raised; hindwing hyaline, dorsum (= anal area) somewhat stepped, margins and distal tip of veins broadly covered with scales, discal spot short, extending to vein M_2. Wing venation (Fig. 90) of forewing with common stalk of veins R_4 and R_5; of hindwing with veins CuA_1 and M_3 arising together from, and CuA_2 minimally proximal of cell tornus. – Abdomen: Short and broad, smoothly scaled; first tergites dorsally sparsely mottled with hair-like scales; anal tuft well developed.

Figs. 1–12. *Cabomina* spp. – **1–3**. *C. hilariformis* n. comb. 1. ♂, Port Natal. 2. ♂ ventral view, South Africa, KwaZulu-Natal, Durban, Umlalo. 3. ♀, KwaZulu-Natal, Durban. – **4–6**. *C. monicae*. 4–5. ♂ holotype. 6. ♂, South Africa, East London, Beacon Bay. – **7–10**. *C. tsomoana*. 7–8. ♂ holotype. 9. ♂ paratype. 10. ♂, South Africa, Drakensberge, Clarens. – **11–12**. *C. dracomontana*, ♂ holotype. – Scales: 10 mm.

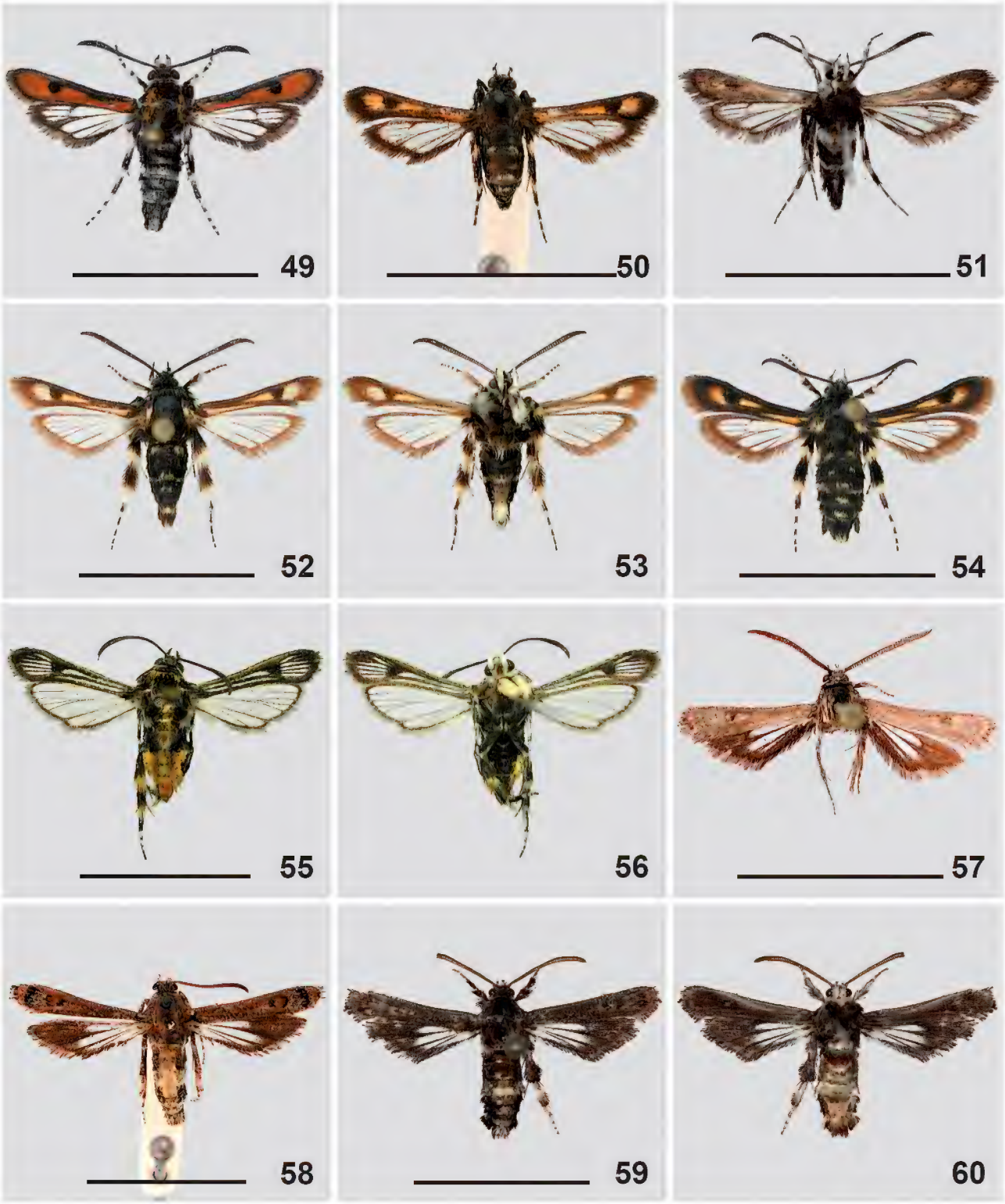
Figs. 13–24. *Cabomina* spp. – **13–15**. *C. ruthmuellerae* n. sp. 13–14. ♂ holotype. 15. ♀ paratype, South Africa, Limpopo Province, Legalameetse. **16**. *C. heliostoma*. ♂ lectotype. **17**. *C.* sp. (*C. ruthmuellerae* n. sp.?) ♀ paralectotype of *C. heliostoma*. – **18–22**. *C. chalypsa* n. comb. 18. ♂ holotype. 19. ♂ black form, Swaziland, Mbabane, Sidwashini. 20–21. ♂ yellow form, same locality. 22. ♀ black form, same locality. – **23–24**. *C. flavivertex* n. sp. 23. ♂ holotype. 24. ♂ paratype, South Africa, Transvaal, Irene. – Scales: 10 mm.



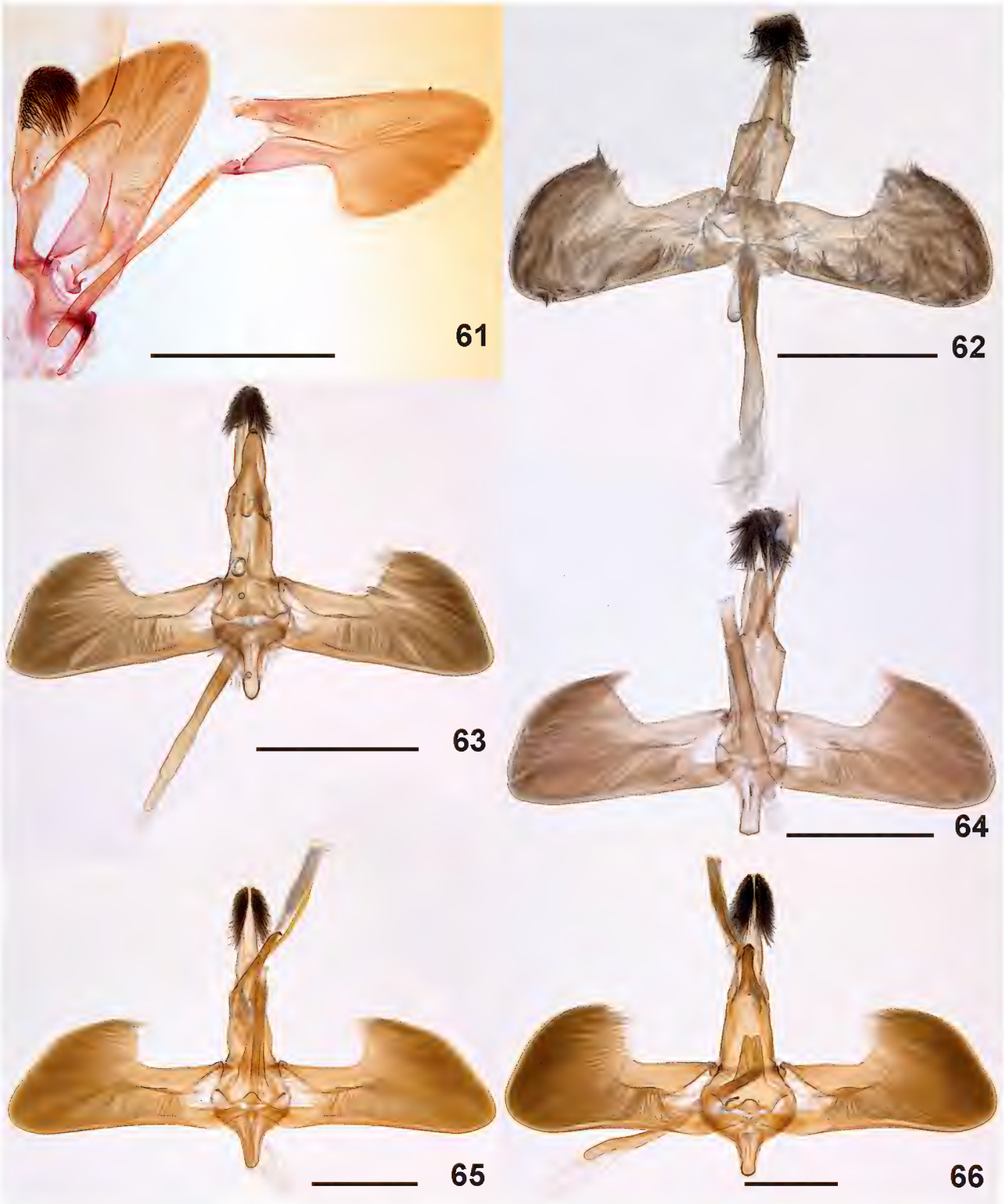
Figs. 25–36. *Cabomina*, *Osminia*, *Aenigmina* and *Noctusphecia* spp. – **25–27**. *C. leucopleura* n. comb. 25. ♀ holotype. 26–27. ♀, South Africa, Pretoria. **28**. *C. tiresa* n. comb. ♂ syntype. **29**. *Osminia namibiana* ♂ holotype. **30**. *Aenigmina critheis* ♂ holotype. – **31–32**. *A. albiapex* n. sp. ♂ holotype. – **33–34**. *Noctusphecia kgalagadia* n. sp. ♀ holotype. – **35–36**. *N. rubra* n. sp. ♀ holotype. – Scales: 10 mm.



Figs. 37–48. *Erismatica*, *Halictina* n. gen. and *Homogyna* spp. – **37–39**. *Erismatica endopyra* n. comb. 37. ♀ holotype. 38. ♀ holotype of *Erismatica erythropis* n. syn. 39. ♀ ventral view, S Rhodesia. – **40–42**. *Halictina andraenipennis* n. comb. 40. ♂ holotype. 41. ♂ ventral view, South Africa, Free State, Sasolburg. 42. ♀, same locality. **43**. *Homogyna spadicicorpus* ♂ holotype. – **44–45**. *H. nama* n. sp. ♂ holotype. **46**. *H. ignivittata* ♂ holotype. – **47–48**. *H. sanguipennis*. 47. ♂ holotype. 48. ♂, South Africa, Kwa-Zulu-Natal, Ntinini. – Scales: 10 mm.



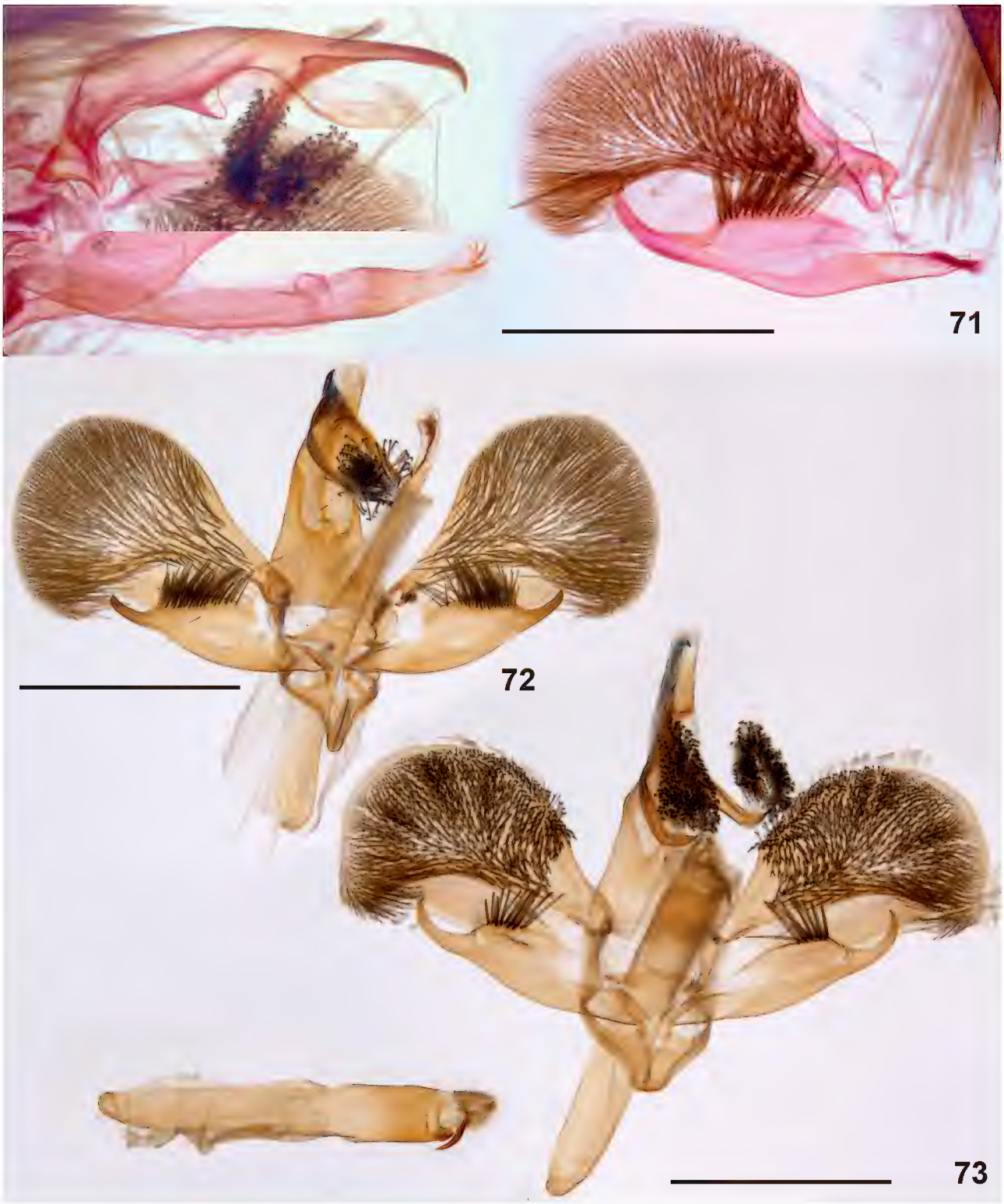
Figs. 49–60. *Homogyna* and *Echidgnathia* spp. – **49**. *H. sanguipennis* ♀ South Africa, KwaZulu-Natal, Ntinini. – **50–51**. *H. xanthophora*. 50. ♀ holotype. 51. ♀ ventral view, South Africa, KwaZulu-Natal, Utrecht. – **52–54**. *H. dukei* n. sp. 52–53. ♂ holotype. 54. ♀ paratype. – **55–56**. *H. xanthomelaena* n. sp. ♀ holotype. **57**. *Echidgnathia khomasana* ♂ holotype. **58**. *E. vitrifasciata* ♀ holotype. – **59–60**. *Echidgnathia* sp. ♂, South Africa, KwaZulu-Natal, vic. Hluhluwe. – Scales: 10 mm.



Figs. 61–66. Genitalia of *Cabomina* spp. – **61**. *C. hilariformis* n. comb., ♂ East London. **62**. *C. monicae*. ♂, South Africa, East London, Beacon Bay. **63**. *C. tsomoana*. ♂, South Africa, Drakensberge, Clarens. **64**. *C. ruthmuellerae* n. sp. ♂ paratype, South Africa, Limpopo Province, Hangklip Forest Res. **65**. *C. chalypsa* n. comb. ♂, Swaziland, Mbabane, Sidwashini. **66**. *C. flavivertex* n. sp. ♂ paratype, South Africa, Transvaal, Irene. – Scales: 1 mm.

Figs. 67–68. Genitalia of *Aenigmina* and *Erismatica* spp. – **67**. *Aenigmina albiapex* n. sp., ♂ South Africa, Pretoria. **68**. *Erismatica endopyra* n. comb. ♂, South Africa, Pienaars river. – Scales: 1 mm.

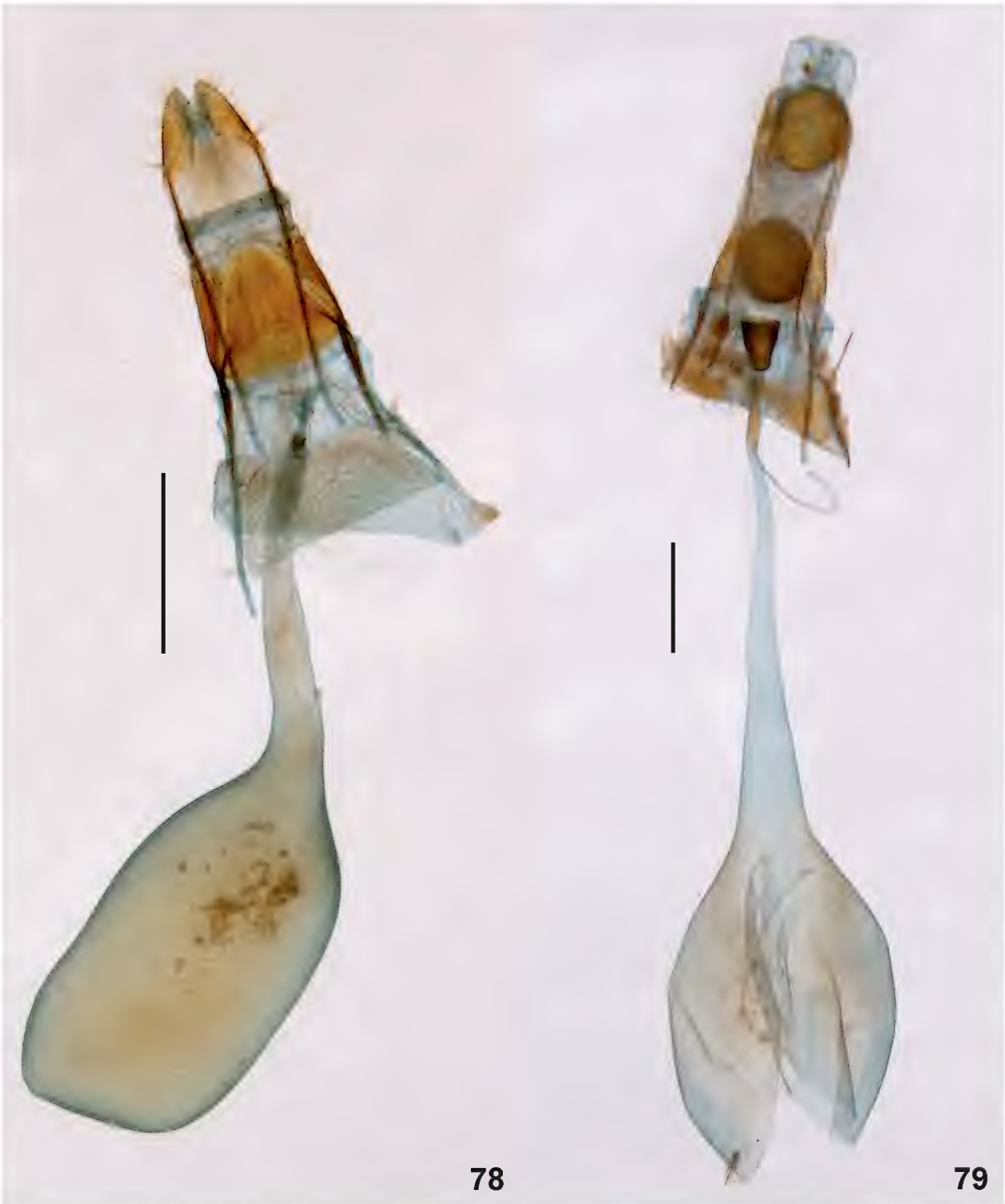
Figs. 69–70. Genitalia of *Halictina* n. gen. and *Homogyna*. – **69**. *Halictina andraenipennis* n. comb., ♂, South Africa, Free State, Sasolburg. **70**. *Homogyna nama* n. sp., ♂ paratype, South Africa, Pienaars river. – Scales: 1 mm.



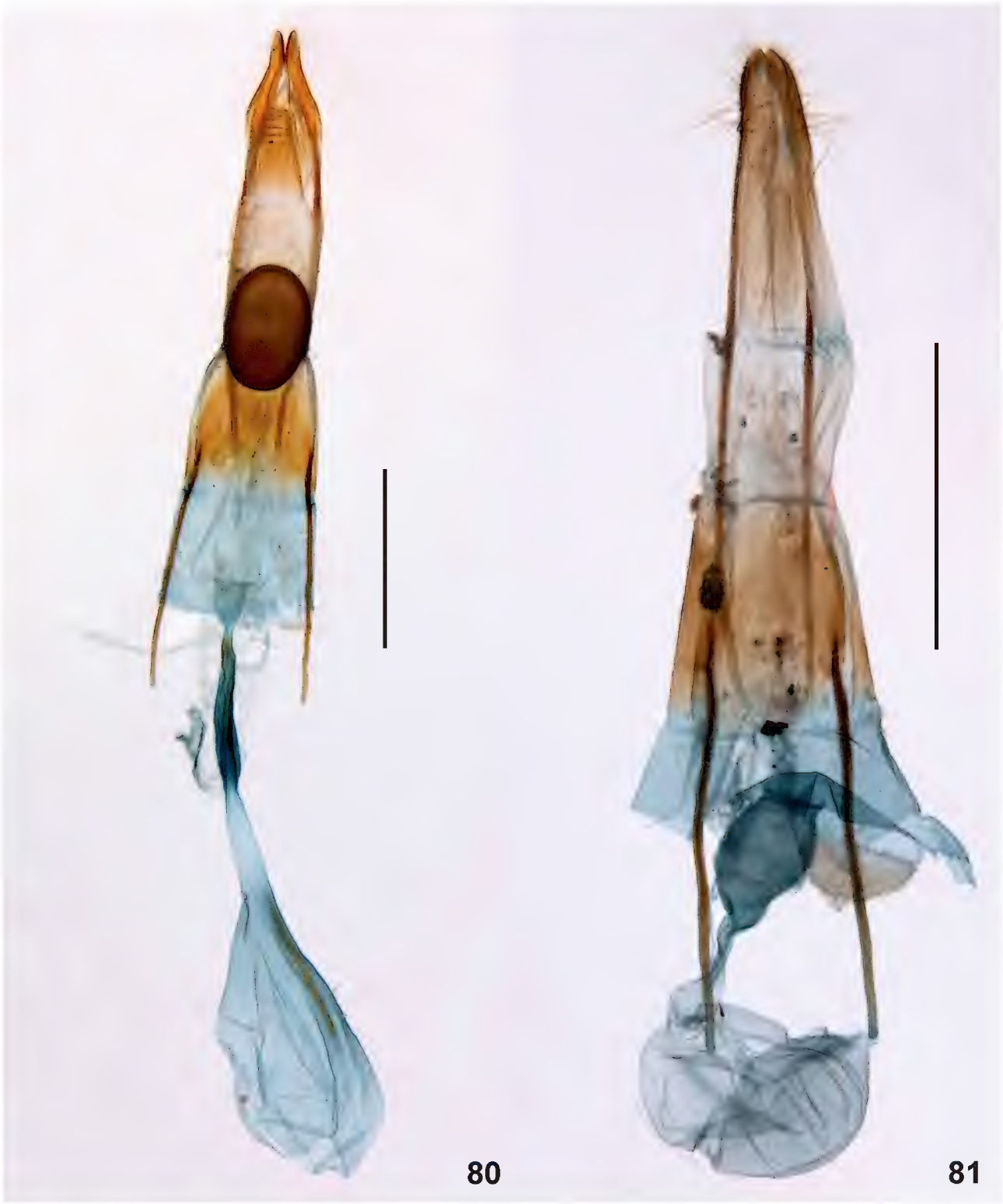
Figs. 71–73. Genitalia of *Homogyna* spp. – **71**. *H. ignivittata*, ♂, South Africa, unknown locality. **72**. *H. sanguipennis*, ♂, South Africa, KwaZulu-Natal, Ntinini. **73**. *H. dukei* n. sp., ♂ holotype. – Scales: 1 mm.

Figs. 74–75. Genitalia of *Echidgnathia* spp. – **74**. *E. khomasana*, ♂ holotype. **75**. *E.* sp. (*E. vitrifasciata*?), ♂, South Africa, KwaZulu-Natal, Hluhluwe. – Scales: 1 mm.

Figs. 76–77. Genitalia of *Cabomina* spp. – **76**. *C. chalypsa* n. comb., ♀, Swaziland, Mbabane, Sidwashini. **77**. *C. leucopleura*, ♀, South Africa, Pretoria. – Scale: 1 mm.

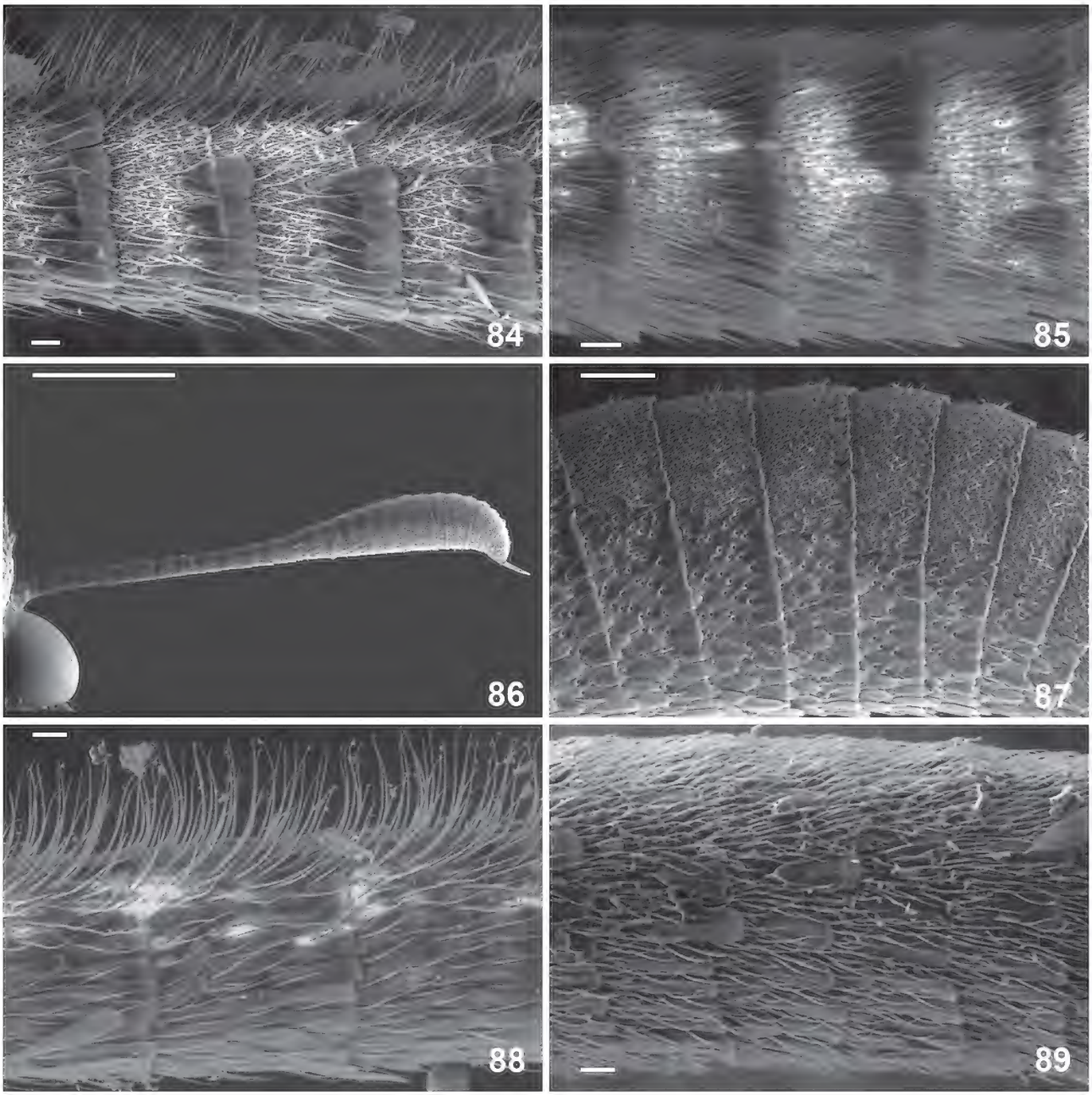


Figs. 78–79. Genitalia of *Erismatica* and *Halictina* n. gen. – **78**. *Erismatica endopyra* n. comb., ♀, Zimbabwe, unknown locality. **79**. *Halictina andraenipennis* n. comb., ♀, South Africa, Free State, Sasolburg. – Scale: 1 mm.

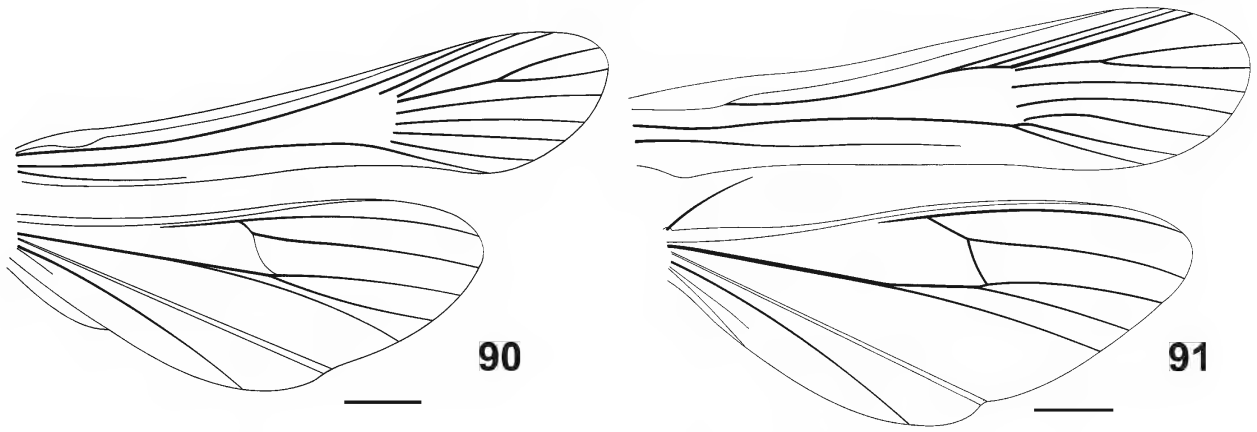


Figs. 80–81. Genitalia of *Homogyna* spp. – **80**. *H. sanguipennis*, ♀, South Africa, KwaZulu-Natal, Ntinini. **81**. *H. xanthophora*, ♀, South Africa, Pretoria. – Scale: 1 mm.

Figs. 82–83. Genitalia of *Homogyna* spp. – **82**. *H. dukei* n. sp., ♀ paratype. **83**. *H. xanthomelaena* n. sp., ♀ paratype. – Scale: 1 mm.



Figs. 84–89. Scanning electron micrographs of male antenna, ventral view, middle part (84, 84, 88, 89), distal part (87). – **84**. *Cabomina tsomoana* Freina, 2011, South Africa, Drakensberge, vic. Clarens. **85**. *Sazonia fenusaeformis* Herrich-Schäffer, 1852, unknown locality. – **86–87**. *Halictina andraenipennis* n. comb., South Africa, Free State, Sasolburg. **88**. *Pseudomelittia berlandi* Le Cerf, 1917, holotype. **89**. *Echidgnathia* sp. ♂, Kenya, Eastern Province, Nyambeni Hills. – Scales: 10 mm (86), 0.1 mm (87), 0.03 mm (84, 85, 88, 89).



Figs. 90–91. Wing venation of *Erismatica* and *Halictina* n. gen. – **90**. *Erismatica endopyra* n. comb. **91**. *Halictina andraenipennis* n. comb. – Scales: 1 mm.

Male genitalia (Fig. 68). Only a single male from TMSA could be examined (parts of its genitalia are broken off, the uncus is lost and the dorsal margins of the valvae are damaged). Tegumen narrow, distally tapering; gnathos short, forming two disto-lateral hooks; valva relatively narrow, trapezoid, apically pointed, medially and ventro-distally with clusters of long, simple and partially bifurcate setae, ventral and distal margin covered with short hairs; saccus short and broad; processus vinculi distally fused with tegumen; juxta narrow, manica with numerous minute spines; phallus straight, long and narrow distally with short sclerotized hook, coecum penis long and narrow; vesica with numerous basad pointing spines.

Female genitalia (Fig. 78). Papillae anales and segment 8 moderately broad, lamella postvaginalis triangular; pairs of apophyses long, posterior pair somewhat longer than anterior one; ostium bursae membranous, funnel-shaped, located intermedially between segment 7 and 8; antrum very short with narrow, sclerotized ring; ductus bursae membranous, very long, gradually enlarged; bursa copulatrix clearly separated, ovoid, anteriorly somewhat truncated, without signum.

Diagnosis

Relatively small, compact clearwing moths without distinct sexual dimorphism. The genus is here characterized as follows: (1) male antenna clavate, entirely covered with short, appressed ciliae; (2) valva trapezoid, crista sacculi absent; (3) setae of valva partially bifurcate, arranged in two confluent, medially and ventro-distally located clusters; (4) phallus with sclerotized distal hook; (5) antrum very short, forming a narrow, sclerotized ring; (6) corpus bursae ovoid, anteriorly truncated, without signum.

A presumably close relationship between *Erismatica* and *Pseudomelittia* Le Cerf, 1917 is evident by the similar structure of the male genitalia, in particular the shape of tegumen, uncus, vinculum and phallus as well as the arrangement and shape of the setae of uncus and valva. Clear differences exist in the male antennae, which are narrow with indistinct, appressed ciliae in *Erismatica*, rather than thick with well visible ventrally protruding ciliae in *Pseudomelittia*; the hindwings with much smaller tornus in *Erismatica*; and the male genitalia with the valva trapezoid, pointed in *Erismatica*, but ovoid and distally rounded in *Pseudomelittia*. It cannot be ruled out that *Erismatica* and *Pseudomelittia* will be synonymized if more species become known. In this case *Pseudomelittia* would have priority.

Species belonging to *Echidgnathia* and *Homogyna* as well as the less closely related *Coccophila* and *Hagnogyna* (Sesiini) are superficially similar. Species of *Hagnogyna* can be distinguished by the striking pectination of the male antennae. The other genera can be differentiated by the venation. In *Erismatica* CuA_1 and M_3 arise from CuA_2 in close proximity to cell tornus; *Hagnogyna* has M_3 and CuA_1 with short common stalk and arising from CuA_2 near the cell tornus; *Echidgnathia* and *Homogyna* have origin of CuA_1 minimally, and of CuA_2 distinctly proximal of cross vein.

Distribution

Erismatica is currently only known from the eastern regions of South Africa and the southern parts of Zimbabwe.

Erismatica endopyra (Hampson, 1910) **n. comb.**
(Figs. 37–39, 68, 78, 90)

Tinthia endopyra Hampson, 1910: 151.
Homogyna endopyra: Hampson 1919: 111; Dalla Torre & Strand 1925: 174; Gaede 1929: 535; Meyrick 1933: 415; Heppner & Duckworth 1981: 43; Pühringer & Kallies 2004: 14, 44.
Erismatica erythropis Meyrick, 1933: 415 **n. syn.**

Type material examined: Holotype of *Tinthia endopyra* ♀ (Fig. 37), "Natal" [South Africa, Natal] (BMNH). Holotype of *Erismatica erythropis* ♀ (Fig. 38), S. Rhodesia, Zimbabwe, nr. Fort Victoria, September, leg. J. Ogilvie (BMNH).

Other material examined: 1 ♀ (Fig. 39), S Rhodesia, [Zimbabwe, locality unreadable] Oct 1936 (gen.-prep. Bartsch 2008–13, Fig. 78); 6 ♀♀, Palabye, B. P. S. E. [?], 18 Oct 1923, leg. R. Stevenson; 1 ♀, S Rhodesia, Ziglzee [?], Distr. Westacre, 23 Oct 1930, R. H. R. Stevenson; 1 ♀, South Africa, Transvaal, Pretoria north, 8–15 Sep 1971; 1 ♂, [South Africa] Pienaars river (gen.-prep. Bartsch 2008–12, Fig. 68; Wing venation, Fig. 90); 1 ♀, Fort Beaufort, 15 Nov 1952, leg. H. K. Munroe (all TMSA).

The type specimens of *Tinthia endopyra* and *Erismatica erythropis* are extremely similar and cannot be distinguished based on external characters. They are considered conspecific herein.

Redescription

Wingspan 17–21 mm, forewing length 7–9 mm, antennal length 6 mm, body length 9–11 mm. – Head: Labial palpus dark grey, dorsally somewhat lighter, first palpomere ventrally and tip of second laterally orange-red; frons grey with pearly sheen; vertex orange-red, interspersed with some grey scales; pericephalic scales orange-red, dorsally interspersed with some white, laterally mixed white and black; antenna black, scape ventrally dark grey. – Thorax: Dark grey with moderate pearly sheen, dorsally fine mottled with black; patagia dark grey with distinct sheen and orange-red lateral spot; scapular spot, inner margin of tegula and a fine medio-dorsal line of mesothorax orange-red; dorso-lateral scale tufts of metathorax white, basally mixed with black. Legs grey, internally paler; fore coxa laterally and distally orange-red, fore tibia dorsally with some orange-red scales; mid femur distally with small, mid and hind tibia medially with large and distally with small orange-red lateral patch. Forewing dark brownish-grey; costal area and discal cell densely, other wing parts sparsely mottled with pale grey scales; wing base black; discal spot, position of longitudinal area up to discal spot and costal margin distally orange-red. Hindwing with veins, margins and discal spot dark brownish-grey; costal margin interspersed with some orange. Underside of both wings with orange more extensive; forewing proximally and at costal area whitish; hindwing with small, black spot at anal vein base; fringes dark brownish-grey. – Abdomen: Tergites dark grey, mottled with some orange scales; tergites 3 and 5–7 (female 5–6) finely interspersed with black; female with tergites 2 and 4–6 dorso-medially orange-red; sternites orange-red; all segments with narrow, grey posterior margin; anal tuft in male distally mixed dark grey and black, laterally orange, in female black, medially mottled with white. Genitalia as stated in the genus description.

Diagnosis

Erismatica endopyra is easily recognizable by the typical contrasted red and black pattern.

5.6 *Halictina* **n. gen.**

Type species: *Melittia andraenipennis* Walker, 1856, designated here.

Etymology

Named after the bee genus *Halictus* Latreille, 1804 (Hymenoptera, Apidae), gender is feminine.

Description

Head: Haustellum well-developed and functional; labial palpus of medium length, slightly bent upward, covered with short, dorsally smooth, ventrally rough scales, second palpomere about 1.5 times the length of other palpomeres; frons smooth, somewhat broader than the diameter of an eye; antenna relatively short, not extending to forewing discal spot, distinctly clubbed with short apical hook, densely covered with scales except for sensitive area, which is restricted to the ventral side of the clubbed part (Figs. 86, 87), superficially the antenna resembles that of the Hesperiidae (Papilionoidea). – Thorax: Strong, smoothly scaled, without raised, hair-like scales, dorso-lateral scale-tufts of metathorax very short; patagia and tegula inconspicuous. Legs strong; fore leg rather short; other legs of normal length; hind leg somewhat topping abdomen; mid- and hind tibia as well as hind tarsus densely tufted with long and broad scales; pairs of spurs of all legs with inner spur rather long, sticking out, outer spur inconspicuous, very short and appressed. Wings relatively short and strong; forewing with transparent areas, discal spot and apical area well-developed; hindwing with discal spot very small, margins narrow and tornus narrowed. Wing venation (Fig. 91) with forewing veins R_4 and R_5 stalked, M_3, CuA_1 and CuA_2 arising approximated from cell tornus, hindwing vein M_2 arising from costal third of cross vein, M_3 from cell tornus and CuA_1 somewhat proximal of it. – Abdomen: Short and strong, merely smooth, tergites 1–3 somewhat rough; anal tuft very short.

Male genitalia (Fig. 69): Tegumen-uncus complex narrow, in ventral view distally tapering; gnathos absent; tuba analis and subscaphium short; uncus laterally flattened, laterally and ventrally densely covered with simple setae.

Valva dorso-distally slightly upturned, distal part densely covered with simple, basad pointing setae; ventral margin subapically with prominent, dorso-distad directed protrusion which is covered with strong sclerotized, long and strait, distally hooked setae. Juxta small, shortly protruded, medio-basally strongly concave. Vinculum fused with tegumen forming a short and broad saccus with rounded tip. Phallus long and very narrow; coecum penis well developed; vesica proximally covered with numerous small spines.

Female genitalia (Fig. 79): Segment 8 and papillae anales rather short and broad; anterior apophyses somewhat shorter than posterior; ostium bursae ovoid; antrum well sclerotized, cup-like; ductus bursae long, narrow, gradually enlarged to form an ovoid bursa copulatrix without signum, which is sclerotized between antrum and ductus seminalis and slightly longitudinally folded.

Diagnosis

The genus *Halictina* can be defined by the following putative synapomorphies: (1) Thorax and abdomen of both sexes almost smooth, without hair-like scales; (2) antenna clubbed, ciliate area restricted to the clubbed part, ciliae very scarce and extremely short; (3) hindwing veins M_3, CuA_1 and CuA_2 arising approximated nearby cell tornus; (4) gnathos absent; (5) ventral margin of valva with a prominent, distad directed protrusion, which is covered with strong sclerotized, long and straight, distally hooked setae; (5) antrum well sclerotized, cup-like.

The characters listed above, especially those of the antenna and the male genitalia are unique within Sesiidae, making *Halictina* easy to recognize. A close relationship to *Pseudomelittia* Le Cerf 1917, as mentioned by Hampson (1919), cannot be confirmed here. The type species of that genus, *P. berlandi* Le Cerf 1917, differs distinctly in numerous important characters. In particular the presence of hair-like scales of the body; the long and slender antennae, which are densely covered with rather long, merely appressed, but ventrally clearly protruding ciliae; the extremely broad hindwing tornus; the regularly spaced forewing veins R_4/R_5 to CuA_2 (M_3, CuA_1 and CuA_2 approximated in *H. andraenipennis*); and the very different shape of the male genitalia (Fig. 69).

Another species from Cameroon, described in *Pseudomelittia* by Gaede (1929), does not belong to Osminiini. Considering external characters it displays remarkable similarities with *Synanthedon pyrostoma* (Meyrick, 1927) from Uganda and *S. erythromma* Hampson, 1919 from Kenya. This species, *Synanthedon cingulata* (Gaede, 1929) **n. comb.**, is here accordingly transferred to *Synanthedon* Hübner, 1819.

Composition and distribution

Currently *Halictina* is represented by a single species, which may be endemic to southern Africa.

Halictina andraenipennis (Walker, 1856) **n. comb.**
(Figs. 40–42, 69, 79, 86–87, 91)

Melittia andraenipennis Walker, 1856: 69; Boisduval 1875: 470.
Pseudomelittia andraenipennis: Hampson 1919: 100; Dalla Torre & Strand 1925: 152; Gaede 1929: 533; Heppner & Duckworth 1981: 42; Pühringer & Kallies 2004: 45.

Type material examined: Holotype ♂ (Fig. 40) Cape [South Africa] (BMNH).

Other material examined: 1 ♀, Olifantsfontein, 16 Jan 1977 (TMSA); 2 ♂♂, South Africa, Free State, W Sasolburg, near Vaal river, 1445 m, 30 Dec 1992, leg. D. Kroon (TMSA); 8 ♂♂, 9 ♀♀ (Figs. 41, 42), same locality, 9 Dec 2007, leg. D. Bartsch (SMNS gen.-prep. 1298, Fig. 69; 1301, Fig. 79) (♂ antenna, Figs. 86, 87; wing venation Fig. 91) (SMNS).

Redescription

Medium sized compact species with distinct bee-like mimicry, wingspan 18–23 mm, forewing length 7–9 mm, antennal length 4 mm, body length 10–11 mm. – Head: Pale yellowish-white; labial palpus laterally and frons medially with some black scales; vertex and dorsal part of pericephalic scales mixed pale yellow and black, the latter laterally white; antenna black, segments of flagellum distally pale yellow, this coloration ventrally more extensive, sensitive area dark brown. – Thorax: Black, dorsally intensively mottled with pale yellow, dorso-lateral scale tufts of metathorax pale yellow. Fore leg pale yellow, more or less densely mottled with black; mid and hind leg with coxa, femur and tarsus black, mid femur dorsally and ventrally, hind femur ventrally pale yellow, mid tibia pale yellow, mottled with some black, hind tibia pale orange, latero-proximally black, scarcely mottled with orange, subdistally with narrow black ring, ventro-medially and -distally pale whitish-yellow; tarsomeres of all legs distally orange-yellow annulated, except for pure black first hind tarsomere; spurs of all legs pale yellow. Forewing black, densely mottled with pale yellow, discal spot black, apical area black with some pale yellow scales, distal margin narrow, pale orange-brown, transparent areas small, covered with translucent, yellow scales, external transparent area broader than high; hindwing hyaline, veins, margins and discal spot dark grey, wing base yellow with some yellow hair-like scales; fringes of all wings light grey, distally with orange tinge. – Abdomen: Black, tergites with posterior margin pale yellow but whitish caudally, laterally more or less orange suffused, proximal margin scarcely mottled with pale yellow; anal tuft black, proximally yellow to orange. Genitalia see genus description (Figs. 69, 79).

Biology and behaviour

According to D. Kroon (pers. comm.) the hostplant is *Ipomoea bathycolpos* (Convolvulaceae). This herb is procumbent, growing on dry, sandy and grassy places.

The moth is strongly attracted to the flowers, which blossom during sunshine from the late morning hours to noon. Both sexes feed on nectar deep within the calyx, where they can be easily found. Eggs are deposited laterally on the sepals of the flower. Larval development may take place in the seed capsule; however, larvae have not as yet been found.

5.7 *Homogyna* Le Cerf, 1911

Type species: *Homogyna alluaudi* Le Cerf, 1911, by monotypy.

Literature: Le Cerf 1911: 303; Dalla Torre & Strand 1925: 151, 174; Gaede 1929: 531, 534; Naumann 1971: 16, 18; Heppner & Duckworth 1981: 43; Fletcher 1982: 56, 79; Vári et al. 2002: 67; Pühringer & Kallies 2004: 14, 44.

Diagnosis

Homogyna and its type species *H. alluaudi* from Kenya were redescribed by Gorbunov & Arita (1998a). Investigation of further species, including such from southern Africa, demonstrates *Homogyna* much more diverse than expected. Two main groups of species can be distinguished, taking structures of the male genitalia into account. This species groups are hereafter referred to as the "*H. pygmaea* group", with *Homogyna alluaudi*, *H. pygmaea* (Rebel, 1899) from Yemen and *H. nama* from Namibia, and the "*H. xanthophora* group", with *H. ignivittata*, *H. sanguipennis*, *H. xanthophora* and *H. dukei* from southern Africa. *H. pygmaea* group has the uncus without dorso-medial protrusion; the valva not specialized, and covered with simple setae. *H. xanthophora* group has the uncus dorso-medially more or less finger-like protruded; the valva with ventral margin proximally thickened, covered with a row of bifurcate setae and distally merging into a specialized, thorn-like protrusion. I refrain from the upgrading of these groups to generic or subgeneric levels since together they form a well-defined, apparently monophyletic assemblage. This is supported by the similar structures of uncus and phallus in males and of ovipositor in females, which may be synapomorphies for the genus. The position of *H. spadicicorpus* Prout, 1919 from Zambia is currently unclear. Gorbunov & Arita (1998b) excluded this species from *Homogyna* based on wing venation and the structures of the hind leg. Furthermore, *H. xanthomelaena* described here cannot be assigned to either group.

Homogyna is here defined as follows: (1) uncus in *H. xanthophora* group medially with narrow, distally ventrad bent, strongly pointed protrusion; in *H. pygmaea* group without such a protrusion; (2) subscaphium and tuba analis very long, often S-curved; (3) valva with ventral margin proximally broad and thick, distal half densely covered with, basad pointing, in *H. pygmaea* group simple, in *H. xanthophora* group bifurcate setae; ventral margin in *H. pygmaea* group simple, in *H. xanthophora* group with proximal half broad and thick, terminating in a strong thorn-like, dorsad bent protrusion; (4) gnathos absent; (5) vinculum present, short; (6) phallus simple, distally regularly tapering, coecum penis reduced, vesica and manica densely covered with numerous fine spines; (7) female genitalia extremely telescopic, with strongly sclerotized, pointed papillae anales.

The two genera *Homogyna* and *Echidgnathia* form a characteristic and in all probability monophyletic group within the Osminiini. Autapomorphy of this group may be the presence of two narrow lateral protrusions of the uncus with a terminal tuft or group of long, bifurcate or short, thorn-like setae, which is unique within the Sesiidae. *Homogyna* differs from *Echidgnathia* by the absence of the gnathos, the normally developed vinculum and the less specialized valvae in male (gnathos large, vinculum reduced, valvae with weakly sclerotized dorso-distal part and strongly modified ventro-proximal part functionally replacing the reduced vinculum in *Echidgnathia*), and by the strongly sclerotized, pointed papillae anales and the scarcely sclerotized antrum in female (papillae anales simple, antrum strongly sclerotized in *Echidgnathia*).

Species of *Homogyna* and *Echidgnathia* can be distinguished immediately from the superficially similar members of *Erismatica*, *Coccophila* and *Hagnogyna* (Sesiini) by hindwing vein CuA_1, which arises distinctly proximal of cross vein (from or near the cell tornus in the genera compared); moreover, species of *Hagnogyna* have the antenna bipectinate.

Distribution

Species of the *H. pygmaea* group are known from South-western and Eastern Africa and from the southern part of the Arabian Peninsula, that of the *H. xanthophora* group occur exclusively in southern Africa.

Key to the species of *Homogyna*

1 Forewing with well developed transparent areas (Fig. 55).... ***H. xanthomelaena* n. sp.**
– Forewing without transparent areas, or only external transparent area present (Figs. 44–54). **2**
2 Forewing predominantly black, wing base with red spot (Fig. 44). **3**
– Forewing predominantly red, margins and discal spot black (Figs. 46–54). **5**
3 Forewing discal spot not colourfully marked (Figs. 44–45). ***H. nama* n. sp.**
– Forewing discal spot red. **4**
4 Forewing discal spot narrow, slightly cuneiform. ***H. alluaudi***
– Forewing discal spot large, round or oval. ***H. pygmaea***
5 Inner margin of forewing broad black (Figs. 50–54). **6**
– Inner margin of forewing red or very narrow black (Figs. 46–49). 7
6 Forewing external transparent area present; hindwing discal spot absent, margins narrow (Figs. 52–54). ... ***H. dukei* n. sp.**

– Forewing external transparent area absent; hindwing discal spot present, margins broad semi-hyaline (Figs. 50–51). ..... ***H. xanthophora***

7 Forewing discal spot small, clearly separated from costal area; hindwing predominantly hyaline (Figs. 47–49). ..... ***H. sanguipennis***

– Forewing discal spot large, fused with costal area; hindwing distally almost opaque (Fig. 46). ..... ***H. ignivittata***

Homogyna spadicicorpus Prout, 1919
(Fig. 43)

Homogyna spadicicorpus Prout, 1919: 110; Dalla Torre & Strand 1925: 175; Gaede 1929: 535; Heppner & Duckworth 1981: 43; Gorbunov & Arita 1998a: 289 (incertae sedis); Vári et al. 2002: 67; Pühringer & Kallies 2004: 14 (incertae sedis).

This species was not examined in detail. No clear information on the number of types is given in the original description, which only refers to the male sex. Only a single male syntype has been found in the BMNH. It is rather well preserved, but lacks both antennae. Unfortunately, nothing is mentioned on their structure in the original description.

Homogyna nama **n. sp.**
(Figs. 44, 45, 70)

Holotype ♂ (Figs. 44, 45): Namibia, vic. Rehoboth, Lake Oanob, hills N of the Lake, 1470 m, 2 Feb 2010, leg. D. Bartsch (SMNS).

Paratypes (2): 1 ♂, same data as holotype, 31 Jan 2010 (SMNS gen.-prep. 3480, Fig. 70); 1 ♂, Namibia, Naukluft, 1580 m, 9 Feb 2010, leg. D. Bartsch (SMNS).

Etymology

This species is named after the Nama people in whose homeland it occurs.

Description

Male. Wingspan 16–17 mm, forewing length 6.0–7.5 mm, antennal length 4.0–4.5 mm, body length 8–9 mm. – Head: Labial palpus white, dorso-distally grey; frons white, medially silver-grey; vertex black; pericephalic scales dorsally mixed white and black, laterally white; antenna black, ventrally densely mottled with whitish scales, scape ventro-basally white. – Thorax: Dorsum black; patagia with intensive metallic gloss, laterally with white patch; scapular spot at wing base white; tegula very scarcely covered with white hair-like scales; mesothorax cranially and caudally with indistinct rusty, medio-dorsal patches. Wings black; forewing with dark greyish tinge, small rusty basal patch and narrow white costal margin; hindwing proximally of crossvein hyaline, distally opaque. Fore leg dorsally black, ventrally white, more or less densely mottled with dark grey; other legs black, tibiae medially and distally as well as tarsomeres proximally annulated with white; hind coxa and lateral part of hind femur mottled with white; spurs of all legs whitish-grey. – Abdomen: Black; tergite 2 medio-dorsally with orange-rusty bar, tergites 4–7 medio-dorsally with orange-white patches, tergite 7 further with broad white posterior margin; scales of anal tuft with white tip. Genitalia (Fig. 70) as stated in the diagnosis of the genus (*H. pygmaea* group). Valva ovoid, somewhat elongate, dorsally regularly curved; phallus straight, distad moderately tapering, manica and vesica densely covered with numerous fine spines.

Female unknown.

Diagnosis

Homogyna nama n. sp. is distinguishable by the almost completely black forewings, the distally black hindwings and the unique coloration of the abdomen. Currently it is the only known member of the *H. pygmaea* group, and therefore the closest relative of the type species *H. alluaudi*, from southern Africa. It is easily separable from *H. alluaudi* and *H. pygmaea* by the absence of a forewing discal spot, the less transparent hindwings, and the lack of abdominal annulations. The male genitalia differ from *H. alluaudi* by the slightly more medio-dorsally upward bent uncus and the ovoid, not triangular valva (the male of *H. pygmaea* is unknown). Members of the *H. xanthophora* group have the forewings red with discal spot, cubitus vein, costal and distal margin more or less intensively black, the abdomen more or less densely mottled with white and, except for *H. ignivittata*, the hindwings more extensively transparent.

Homogyna ignivittata Hampson, 1919
(Figs. 46, 71)

Homogyna ignivittata Hampson, 1919: 110; Dalla Torre & Strand 1925: 175; Gaede 1929: 535; Heppner & Duckworth 1981: 43; Gorbunov & Arita 1998a: 289; Vári et al. 2002: 67; Pühringer & Kallies 2004: 14.

Type material examined: Holotype ♂ (Fig. 46) South Africa, Transvaal, Pretoria, 6 Feb 1914, leg. A. J. T. Janse (BMNH).

Other material examined: 2 ♀♀, South Africa, Elandshoek, 20–25 Nov 1947, A. L. Capener; 1 ♀, South Africa, Transvaal, Argent., 24 Dec 1939, A. L. Capener; 1 ♀, Swaziland, Budungu Mines, 1 Sep 1993, N. J. Duke; 1 ♂, South Africa, unknown locality (TMSA gen.-prep. 3826, Fig. 71) (all TMSA).

Diagnosis

Homogyna ignivittata is the first of four species of the *H. xanthophora* group (further *H. sanguipennis*, *H. xanthophora* and *H. dukei*), which have the forewings more or

less orange or red. It can be separated by having the black forewing discal spot smallest, but most clearly defined; the hindwings distally opaque (hyaline in the species compared), the thorax dorsally intensively reddish suffused (less intensive in *H. sanguipennis*, without red in *H. xanthophora* and *H. dukei*); and the abdomen more intensively mottled with white. Differential characters of the male genitalia within this group are: uncus and thorn-like protrusion of valva long in *H. ignivittata* and *H. dukei*, short in *H. sanguipennis*; row of setae of ventral margin of valva dense in *H. ignivittata*, scanty in *H. dukei*, very dense in *H. sanguipennis*; saccus short in *H. ignivittata* and *H. sanguipennis*, very short in *H. dukei*, phallus almost equal in diameter, distally slightly narrowed with five thorns regularly increasing in size in *H. ignivittata*, very broad proximally, gradually tapering, narrow distally, vesica with row of thorns in *H. sanguipennis*, equal in diameter, ventro-distally with strong thorn, and vesica with numerous spines in *H. dukei*. The male genitalia of *H. xanthophora* are unknown.

Biology and behaviour

Unknown. An image found in the internet may show a specimen resting on a flower of *Hibiscus pusillus* (http://joeleagle.files.wordpress.com/2013/01/hibiscus-pusillus.jpg).

Homogyna sanguipennis (Meyrick, 1926) (Figs. 47–49, 72, 80)

Paranthrene sanguipennis Meyrick, 1926: 267; Gaede 1929: 534; Heppner & Duckworth 1981: 24; Väri et al. 2002: 67.
Homogyna sanguipennis: Gorbunov & Arita 1998a: 289; Pühringer & Kallies 2004: 14.

Type material examined: Lectotype ♂ (Fig. 47), South Africa, Natal, Weenen, Oct 1924, leg. Thomasset (BMNH) (designated here). – Paralectotype ♀, same data (BMNH).

Other material examined: 3♂♂ (Fig. 48), 14♀♀ (Fig. 49), South Africa, KwaZulu-Natal, Ntinini, 1070 m, 29 Nov–2 Dec 2010, leg. D. Bartsch, at flowers of *Hibiscus pusillus* (♂, Bartsch gen.-prep. 2013-05, Fig. 72; ♀, 2013-06, Fig. 80) (CDB).

Two syntypes, a male and a female, are mentioned in the original description of Meyrick (1926). Although their conspecificity is likely due to the similarity of the reddish coloured species within *Homogyna*, this cannot be easily proven. To ensure stability of the nomenclature I therefore select the before mentioned male as the lectotype.

Diagnosis

Considering external characters, *Homogyna sanguipennis* appears very similar and may well be confused with *H. ignivittata*. It is separable by the less reddish suffused thorax, the less whitish mottled body, the larger forewing discal spot, which is somewhat fused with the black costal area, the less prominent brownish cubitus veins, and the more extensively hyaline hindwings. For differentiation of the male genitalia (Fig. 72) from related species see *H. ignivittata*. The female has the antrum straight, long and narrow (slightly S-curved in *H. xanthomelaena*; enlarged in *H. dukei*) and has, uniquely within the genus, the corpus bursae with a narrow, longitudinal signum (Fig. 80).

Biology and behaviour

A series of three males and 14 females from Ntinini was captured by the author in the late morning between 10 and 12 h on dry, regularly burned grassland. The moths were exclusively visiting the yellow flowers of *Hibiscus pusillus* (Malvaceae) and could be observed feeding nectar or resting on the petal. Mating was also observed to take place on these flowers. Specimens that had been disturbed flew up immediately, but landed after a short flight on one of the neighbouring *H. pusillus* flowers. Various artificial pheromones, which were used in the habitat did not attract any males.

Hibiscus pusillus is strongly suggested to be the host plant of this species. However, despite intensive search no eggs could be found. I assume that deposition of eggs most likely takes place deep in the calyx or, even more probably, directly within the verdant seed head, which is suggested by the strongly pointed and sclerotized ovipositor of the female. *Hibiscus pusillus* has a woody rootstock and shoots annually. It is a pioneer in disturbed places and occurs from the Cape to Mozambique and westwards through Botswana to Namibia.

Homogyna xanthophora (Hampson, 1910) (Figs. 50, 51, 81)

Tinthia xanthophora Hampson, 1910: 150.
Homogyna xanthophora: Hampson 1919: 111; Gaede 1929: 535; Heppner & Duckworth 1981: 43; Väri et al. 2002: 67; Gorbunov & Arita 1998a: 289; Pühringer & Kallies 2004: 14.

Type material examined: Holotype ♂ (Fig. 50), South Africa, Natal, Malvern, Dec 1907, leg. Barker (BMNH).

Other material examined: 1♀, South Africa, KwaZulu-Natal, Utrecht, 1250–1320 m, 8 Dec 2010, leg. D. Bartsch (Fig. 51) (Bartsch gen.-prep. 2015-02, Fig. 81) (CDB).

Diagnosis

H. xanthophora differs from all congeners by the pure black, not reddish suffused thorax, the dark blackish-brown forewing, with orange-red markings along inner margin, and proximal and distal of discal spot, the large, black forewing discal spot, fused with the black costal area and the black cubitus vein, the hyaline hindwings

with broad distal margin, and black scales between veins CuA_1 and CuA_2, and the abdomen with indistinct whitish annulations on tergites 2, 4, 6 (and 7 in male). The genitalia of the male are unknown, those of the female are similar to the following *H. dukei*, the ductus bursae rather short; the antrum ovoid enlarged, membranous; and the bursa copulatrix ovoid, without signum (Fig. 81).

Homogyna dukei **n. sp.**
(Figs. 52–54, 73, 82)

Holotype ♂ (Figs. 52, 53): South Africa, Cape Province, East London, Buffalo Pass, 18 Nov 1979, leg. N. J. DUKE (BARTSCH gen.-prep. 2009-11, Fig. 73) (TMSA).

Paratypes (4): 1 ♂, 1 ♀, in copula, same data as holotype (♀ Fig. 54), 19 Sep 1982 (♀ BARTSCH gen.-prep. 2009-12, Fig. 82); 2 ♀♀, [South Africa, Eastern Cape, Port Elizabeth] Algoa Bay, 26 Nov 1908, leg. BRAUNS (all TMSA).

Etymology

This beautiful species is dedicated to the late N. J. DUKE (Mbabane, Swasiland) one of the collectors of the type series.

Description

Male. Wingspan 16–20 mm, forewing length 7.0–8.5 mm, antennal length 4.0–5.5 mm, body length 9.5–10.5 mm. – Head: Labial palpus white, second palpomere laterally with narrow black stripe, third palpomere dorsally and laterally black; frons white, medially black; vertex black; pericephalic scales white, dorsally mixed with black; antenna black, ventrally scarcely mottled with white, segments of flagellum with narrow white ventro-distal margin. – Thorax: Glossy black; patagia with strong gloss; mesothorax dorso-cranially with white, hair-like scales; distal part of tegula and scapular-spot at forewing base white. Fore leg with coxa white, basally dark grey; femur dorsally dark grey, ventrally white; tibia dorsally black with narrow white spot medially, ventrally white. Mid and hind leg black, femur ventrally with long, white, hair-like scales; tibia with white ring medially and some white scales distally; tarsomeres of all legs proximally white, distally black; spurs white. Wings black; transparent areas more or less densely covered with pale orange scales, partially hyaline, particularly external transparent area, which consists of 5 cells; forewing discal spot and apical area broad, seamlessly fused with costal and anal area; hindwing hyaline, veins and distal margin fine brownish-grey, discal spot reduced; fringes of all wings grey, at hindwing dorsum white. – Abdomen: Black with white spots dorso-laterally on tergite 2, dorso-medially on tergites 4, 5 and 7; tergite 4 with indistinct and tergite 7 with distinct white posterior margin; sternites 4–7 whitish; anal tuft black, distally and ventrally white. Genitalia (Fig. 73) as specified in the diagnosis of the genus (*H. xanthophora* group). Uncus long and thorn-like; valva with thorn-like, ventral protrusion rather long, ventral margin covered with a row of about 15, partially shortly bifurcate setae; saccus very short; phallus equal in diameter, with a single strong thorn ventro-distally, vesica covered with numerous fine spines.

Female. More compact than the male. – Thorax: Fresh specimens with distinct orange tinge; margins of tegula and a dorso-caudal spot of mesothorax white. Orange forewing markings less extensive, but more intense; hindwing margins broader. – Abdomen: White spots dorso-laterally on tergites 2 and 3 and dorso-medially on tergites 4–6; segments 4 and 7 with dorsally narrow, laterally broad, ventrally interrupted white posterior margins; sternites and anal tuft black, the latter dorso-distally white. Genitalia (Fig. 82) similar to *H. xanthophora*, but ductus bursae shorter, antrum round and enlarged, membranous; bursa copulatrix longitudinal-ovoid, without signum.

Diagnosis

Homogyna dukei n. sp. is very similar to *H. xanthophora*. Using external characters, *H. dukei* can be best separated by the less extensive, rather clearly defined orange coloration of the forewing, the partially hyaline external transparent area, the reduced hindwing discal spot, the – especially in male – much smaller hindwing margins (orange forewing coloration not clearly circumscribed; external transparent area opaque throughout; hindwing discal spot well developed in *H. xanthophora*), and the black second abdominal sternite (whitish in *H. xanthophora*). *H. ignivittata* and *H. sanguipennis* can be distinguished by the coloration of the forewing, which is more extensive red and lacks the broad, black apical area. For differentiation of the male genitalia from related species see *H. ignivittata*. The female genitalia differ from that of *H. sanguipennis* and *H. xanthomelaena* by the membranous, round, enlarged ductus bursae (membranous, long and slender in *H. sanguipennis*; slightly enlarged with sclerotized signum in *H. xanthomelaena*). *H. sanguipennis* differs further by the presence of a signum of the bursa copulatrix.

Biology and behaviour

Unknown. A male, feeding nectar on flowers of *Hibiscus aetiopicus* (Malvaceae), which may possibly be the host plant, is figured at http://www.ispotnature.org/node/582446?nav=related.

Homogyna xanthomelaena **n. sp.**
(Figs. 55, 56, 83)

Holotype ♀ (Figs. 55, 56): Namibia, NW Okahandja, Farm Ongombeanavita, 9 Nov 1958 (TMSA).

Paratypes (3): 2♀♀, same data as holotype; 1♀, Namibia, Abachaus, 10 Mar 1952 (Bartsch gen.-prep. 2013-13, Fig. 83) (all TMSA).

Etymology

From ancient Greek xanthos (= yellow) and melas (= black).

Description

Female. Wingspan 18–20 mm, forewing length 7.7–8.5 mm, antennal length 6.5 mm, body length 10–11 mm. – Head: Labial palpus white, first palpomere distally with narrow black ring, other palpomeres dorsally mottled with black; frons glossy white, medially dark grey; vertex black; pericephalic scales white; antenna black. – Thorax: Black; patagia black with blue-metallic gloss, laterally orange-yellow; tegula caudally, mesothorax (except for medial part) dorsally, and metathorax dorso-medially orange-yellow; dorso-lateral scale tufts of metathorax pale grey. Legs black; fore coxa cream-coloured; mid and hind femur ventrally with white, long hair-like scales; mid tibia ventrally with orange-yellow medial patch and some orange-white distally; hind tibia medially and distally with broad orange-yellow ring; tarsomeres of all legs proximally white; spurs white, ventrally black. Wings black; forewing with costal area yellow, transparent areas well developed, longitudinal one reaching down to discal spot, external one consisting of 6 cells, discal spot broad, apical area narrow; hindwing hyaline, discal spot reduced; fringes of all wings pale grey, at hindwing dorsum white. – Abdomen: Black; tergites 1–3 dorso-medially densely mottled with orange-yellow, remaining tergites orange-yellow, sublaterally mottled with black; anal tuft dorsally and laterally orange-yellow, ventrally black. Genitalia (Fig. 83) as stated in the genus diagnosis. Papillae anales and segment 8 rather broad; ductus bursae rather short, somewhat enlarged, S-curved, with narrow sclerotized signum; bursa copulatrix ovoid, clearly separated, without signum.

Male unknown.

Diagnosis

Homogyna xanthomelaena n. sp. occupies a somewhat isolated position within the genus. The well-developed transparent areas of the forewing and the orange-yellow pattern of the body are unique features. Superficially, *Pseudomelittia berlandi* from Tanzania is somewhat similar. It differs by the much broader hindwing dorsal area, the narrower antenna, the absence of orange-yellow markings and the presence of a narrow longitudinal scale line of the anterior transparent area of the forewing. The female genitalia are characterized by the rather short, somewhat enlarged and slightly S-curved ductus bursae with small, sclerotized signum (ductus bursae in congeners without sclerotization, long and narrow in *H. sanguipennis*, short and enlarged in *H. xanthophora*).

5.8 *Echidgnathia* Hampson, 1919

Type species: *Tinthia vitrifasciata* Hampson, 1910, by original designation.

Literature: Dalla Torre & Strand 1925: 151; Gaede 1929: 531; Naumann 1971: 16; Heppner & Duckworth 1981: 43; Fletcher 1982: 56; Vári et al. 2002: 67; Pühringer & Kallies 2004: 44.

Diagnosis

Echidgnathia is here defined by the following characters: (1) gnathos present, very large; (2) subscaphium and tuba analis short; (2) vinculum reduced; (3) valva highly specialized, ventro-proximally sclerotized and strongly modified, taking over the function of the vinculum, dorso-distally weak with scarce hairs; (4) phallus simple, distally somewhat tapering, coecum penis reduced, vesica with strong sclerotized thorns; (5) female genitalia with prominent, well sclerotized antrum. The absence of the vinculum and the extreme specialization of the valva may well be synapomorphic.

For differentiation from related genera see diagnosis of *Homogyna*.

Composition and distribution

Currently *Echidgnathia* is represented by two species which both occur in southern Africa, but some further, undescribed species are known from eastern Africa, northwards to Somalia.

Echidgnathia khomasana Freina, 2011
(Figs. 57, 74)

Type material examined: Holotype ♂ (Figs. 57, 74) Namibia, 30–40 km ENE Omaruru, 1500 m, 21–23 Jan 1998, leg. J. J. de Freina (CMWM, later in ZSM).

Echidgnathia khomasana was described from a single somewhat descaled male. The specimen was dissected and the abdominal segments were discarded, the phallus was damaged with the vesica lost. Nevertheless, *E. khomasana* is easily distinguished from *E. vitrifasciata* by the much paler, almost uniformly grey forewings, which have a narrow black discal spot. The male genitalia (Fig. 74) differ by the long, bifurcate setae of the two lateral protrusions of the uncus (short, thorn-like in *E. vitrifasciata*), the distally broad, spatulate gnathos (narrow, curved in *E. vitrifasciata*) and the dense, ventro-proximal patch of setae of the valva (absent in *E. vitrifasciata*). Similar bifurcate setae of the uncus are present in *Homogyna* and may represent a convergent development in the two genera.

Echidgnathia vitrifasciata (Hampson, 1910)
(Figs. 58–60, 75)

Tinthia vitrifasciata Hampson, 1910: 150.
Echidgnathia vitrifasciata: Hampson 1919: 97; Dalla Torre & Strand 1925: 151; Gaede 1929: 531; Heppner & Duckworth 1981: 43; Vári et al. 2002: 67; Pühringer & Kallies 2004: 44.

Type material examined: Syntypes 3 ♀♀ (Fig. 58), Mashonaland, Umtali [Zimbabwe, Mutare], Dec 1900 (BMNH).

Other material examined (conspecificity questionable): 1 ♂ (Figs. 59, 60), South Africa, KwaZulu-Natal, vic. Hluhluwe, Farm "Sydafrica", 30–100 m, 7 Dec 2010, leg. D. Bartsch (Bartsch gen.-prep. 2013-07, Fig. 75) (CDB).

I have no doubt about the conspecificity of the type series and refrain from the designation of a lectotype. Males of *E. vitrifasciata* are unknown. Four badly damaged females in TMSA, which have destroyed abdomina, may belong here but are not taken into account. A single, somewhat descaled male from KwaZulu-Natal (Figs. 59, 60) is also not considered, as its conspecificity is not clear. This specimen is similar to that of the type series, but differs by the lack of the yellowish-white, dorso-medial band of the abdomen.

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Skull identification key for Central European shorebirds (Aves: Charadriiformes: Scolopaci and Charadrii)

Florian Schäfer & Gregor Schmitz

Abstract

Although the shorebirds (Charadriiformes: Scolopaci and Charadrii) are among the most thoroughly studied bird orders in Central Europe, no precise key for the identification of their skulls was available. This paper seeks to remedy this lack by presenting a dichotomous identification key for 38 species of shorebirds from Germany. Photographs and biometric measurements of the skulls are included to support the identification process.

Keywords: Aves, Charadriiformes, Charadriidae, Scolopacidae, Burhinidae, Haematopodidae, Recurvirostridae, skull morphology, identification key.

Zusammenfassung

Obwohl die Watvögel (Charadriiformes: Scolopaci und Charadrii) zu den viel beobachteten Vogelgruppen zählen, lag bisher kein präziser Bestimmungsschlüssel für die Schädel der mitteleuropäischen Arten vor. Mit der vorliegenden Arbeit wird diese Lücke geschlossen und ein dichotomer Schlüssel zur Bestimmung von 38 in Deutschland lebenden Watvogelarten vorgestellt. Zur Erleichterung der Bestimmung sind Fotos und Messdaten beigefügt.

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1 Introduction

Although the shorebirds (Charadriiformes: Charadriidae and Scolopacidae) are a special focus of ornithologists, an identification key for the skulls of this group still does not exist for Central Europe. As part of a graduate thesis project at the University of Konstanz (Schäfer 2014), the skulls of 38 German shorebird species were measured and analyzed in terms of functional anatomy and feeding behavior. Based on the underlying data and measurements, a distinction can even be made between skulls of closely related species. In this paper, we present a dichotomous identification key. In addition, we include supportive morphometric data and illustrations.

The skull of the Charadriiformes is characterised by the well-developed rhynchokinesis of its bill (Hoerschelmann 1970, Gussekloo et al. 2001). According to this the bill is schizorhinous or – rarely – secondary holorhinous (but in Pluvianidae and Burhinidae probably primary holorhinous) (Mickoleit 2004).

As mentioned in Ellrott & Schmitz (2010), the skull identification key presented in Brown et al. (2003) includes general skull types and the bill-cranium-ratio and was supplemented with illustrations and some basic morphometric data. Unfortunately, the number of specimens examined was not specified (except when only one specimen was available). The illustrations were not very detailed, not suited to comparing species, and some important species were missing.

Jansen & van Gestel (2009) present the following measurements on their "skullsite": total length, length, width and height of cranium, upper bill length, skull relation (total length/upper bill length). The photographs are clear and informative. Unfortunately, the measurements are taken from just one specimen in each case. In addition, despite the enormous number of species included, some Central European species are missing.

Because Germany has a good cross-section of the Central European fauna, we based our analysis on the species list in Barthel & Helbig (2005), but excluded very rare species in order to keep the identification key practical (see section 2 under "Species selection").

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Tab. 1. Species included in the determination key. – Nomenclature according to BAUER et al. (2005), systematic order according to DEL HOYO et al. (1992).

Scientific name	English name	German name
Charadrii		
Burhinidae		
Burhinus oedicnemus (Linnaeus, 1758)	Stone curlew	Triel
Haematopodidae		
Haematopus ostralegus Linnaeus, 1758	Eurasian oystercatcher	Austernfischer
Recurvirostridae		
Himantopus himantopus (Linnaeus, 1758)	Black-winged stilt, Common stilt	Stelzenläufer
Recurvirostra avosetta Linnaeus, 1758	Pied avocet, Eurasian avocet	Säbelschnäbler
Charadriidae		
Vanellus vanellus (Linnaeus, 1758)	Northern lapwing, Peewit	Kiebitz
Pluvialis squatarola (Linnaeus, 1758)	Grey plover, Black-bellied plover	Kiebitzregenpfeifer
Pluvialis apricaria (Linnaeus, 1758)	European golden plover	Goldregenpfeifer
Charadrius dubius Linnaeus, 1786	Little ringed plover	Flussregenpfeifer
Charadrius hiaticula (Linnaeus, 1758)	Common ringed plover	Sandregenpfeifer
Charadrius alexandrinus Linnaeus, 1758	Kentish plover	Seeregenpfeifer
Charadrius morinellus (Linnaeus, 1758)	Eurasian dotterel	Mornellregenpfeifer
Scolopaci		
Scolopacidae		
Numenius phaeopus (Linnaeus, 1758)	Whimbrel	Regenbrachvogel
Numenius arquata (Linnaeus, 1758)	Eurasian curlew	Großer Brachvogel
Limosa limosa (Linnaeus, 1758)	Black-tailed godwit	Uferschnepfe
Limosa lapponica (Linnaeus, 1758)	Bar-tailed godwit	Pfuhlschnepfe
Scolopax rusticola (Linnaeus, 1758)	Eurasian woodcock	Waldschnepfe
Lymnocryptes minimus (Brünnich, 1764)	Jack snipe	Zwergschnepfe
Gallinago gallinago (Linnaeus, 1758)	Common snipe	Bekassine
Phalaropus lobatus (Linnaeus, 1758)	Red-necked phalarope	Odinshühnchen
Phalaropus fulicarius (Linnaeus, 1758)	Red phalarope, Grey phalarope	Thorshühnchen
Actitis hypoleucos (Linnaeus, 1758)	Common sandpiper	Flussuferläufer
Tringa erythropus (Pallas, 1764)	Spotted redshank	Dunkler Wasserläufer
Tringa totanus (Linnaeus, 1758)	Common redshank	Rotschenkel
Tringa stagnatilis (Bechstein, 1803)	Marsh sandpiper	Teichwasserläufer
Tringa nebularia (Gunnerus, 1767)	Common greenshank	Grünschenkel
Tringa ochropus Linnaeus, 1758	Green sandpiper	Waldwasserläufer
Tringa glareola Linnaeus, 1758	Wood sandpiper	Bruchwasserläufer
Philomachus pugnax (Linnaeus, 1758)	Ruff	Kampfläufer
Arenaria interpres (Linnaeus, 1758)	Turnstone	Steinwälzer
Limicola falcinellus (Pontoppidan, 1763)	Broad-billed sandpiper	Sumpfläufer
Calidris canutus (Linnaeus, 1758)	Red knot	Knutt
Calidris alba (Pallas, 1764)	Sanderling	Sanderling
Calidris minuta (Leisler, 1812)	Little stint	Zwergstrandläufer
Calidris temminckii (Leisler, 1812)	Temminck's stint	Temminckstrandläufer
Calidris melanotos (Viellot, 1819)	Pectoral sandpiper	Graubrust-Strandläufer
Calidris ferruginea (Pontoppidan, 1763)	Curlew sandpiper	Sichelstrandläufer
Calidris maritima (Brünnich, 1764)	Purple sandpiper	Meerstrandläufer
Calidris alpina (Linnaeus, 1758)	Dunlin	Alpenstrandläufer

2 Materials und Methods

Species selection

Species selection is based on BARTHEL & HELBIG (2005). From the 61 shorebird species listed in this paper, we included 38, because the others are classified as vagrants with an average of less than five records per year since 1980.

Materials

The skull material originates mainly from the NIKOLAUS Collection (Stuttgart State Museum of Natural History). We also used specimens from the SCHMITZ Collection (University of Konstanz) and the collection of the Osteology Department of the Baden-Württemberg State Office for Monuments and Antiquities (Landesdenkmalamt Baden-Württemberg – Arbeitsstelle Osteologie) in Konstanz (particularly for skulls of *Numenius phaeopus*). We requested thirteen other collections to send us specimens of shorebirds, however none were available.

Of the 38 species selected, we analyzed ten specimens each, all of which met the necessary condition, i. e. no damage that could prevent proper measuring. An effort was made to maintain a balanced sex ratio in selecting the skulls. In contrast to the Anseriformes (cf. ELLROTT & SCHMITZ 2010), shorebird skulls are less common in collections. For the following species, less than ten specimens could be included: *Burhinus oedicnemus* (9), *Numenius phaeopus* (9), *Tringa glareola* (9), *Himantopus himantopus* (8), *Calidris canutus* (8), *Actitis hypoleucos* (7), *Limicola falcinellus* (6), *Calidris temminckii* (5), *Lymnocryptes minimus* (4), *Calidris minuta* (4), *Tringa nebularia* (4), *Tringa ochropus* (4), *Phalaropus fulicarius* (3), *Tringa stagnatilis* (3), *Charadrius morinellus* (2), *Calidris melanotos* (1), *Phalaropus lobatus* (1), *Calidris maritima* (1) (see Tab. 1 for the nomenclature).

For photographic documentation, we chose those individuals that were most representative (i. e. with measurements close to mean values).

Abbreviations and measurements

The morphological terminology is based on BAUMEL & WITMER (1993), JOSEPH & STRAUCH (1978), KING & MCLELLAND (1978), and HUMMEL (2000). The skulls were measured as follows (see also Figs. 1a, 1b, Tab. 2):

Skull

TL	Total length (= upper bill length plus cranial length, i. e. the total length was not measured separately)
CL	Length of cranium: measured from a theoretical line between the occipital ends of the nostrils to the prominentia cerebellaris
UBL	Length of upper bill: measured from tip of upper bill to a theoretical line between the occipital ends of the nostrils

Cranium

CH	Height of cranium
CW	Width of cranium: measured behind postorbital process
OD	Diameter of orbita: measured from base of postorbital process to base of lacrimal
SG	Salt gland depressions: present ("yes") or absent ("no")
SOW	Width of supraorbital isthmus: measured at narrowest extent

Upper bill

BTS	Upper bill tip: protruding (cf. Fig. 6) "yes" or "no"
HC	Pits of Herbst corpuscles: present ("yes") or absent ("no")
NL	Length of nostril opening
PL	Length of premaxillar: measured from tip of upper bill to rostral end of nostril
UBS	Shape of upper bill (see lateral view): divided into three categories: "straight", "curved down" or "curved up"

Lower bill

LBH	Height of lower bill (in the region of the angulus mandibulae)
LBL	Length of lower bill

3 Identification key

The complete data set for all 38 species is presented in Tab. 2.

1 Upper bill length and cranial length almost equal (CL : UBL = max. 1 : 1.1). **2**
– Upper bill longer than cranium (CL < UBL). **10**
2 TL > 75 mm, no supraoccipital foramina, diameter of orbita > 22 mm (Fig. 48). ..... (Burhinidae) only ***Burhinus oedicnemus***
– TL < 75 mm, 2 supraoccipital foramina, diameter of orbita < 22 mm. **3**
3 Orbital edges at the supraorbital isthmus parallel (Fig. 2), orbit edge never enlarged (Fig. 37), without distinct depressions of the salt glands. ..... ***Arenaria interpres***
– Orbital edges at the supraorbital isthmus concave (dorsal view) and dorsally conspicuously enlarged (Fig. 3), often with distinct depressions of the salt glands. ...(Charadriidae) **4**
4 Supraorbital isthmus with 2 distinct depressions of the salt glands (Fig. 4). **5**
– Supraorbital isthmus without distinct depression of the salt glands (Figs. 3, 5). **9**
5 TL < 60 mm. **6**
– TL > 60 mm (Fig. 16). .. (Vanellinae) only ***Vanellus vanellus***
6 Prefrontale conspicuously separated from the frontale (dorsal orbit edge) (Figs. 3, 20). ..... ***Charadrius alexandrinus***
– Prefrontale and frontale fused (cf. Fig. 5). **7**
7 TL > 48 mm (Fig. 14). ..... ***Charadrius morinellus***
– TL < 45 mm. **8**
8 Dorsal orbit edge conspicuously enlarged, depression of the salt glands distinct, upper bill tip relatively solid, CW > 15mm, OD > 12 mm (Fig. 19). ..... ***Charadrius hiaticula***
– Dorsal orbit edge slightly enlarged, depression of the salt glands less distinct, upper bill tip slender, CW < 15mm, OD < 12 mm (Fig. 18). ..... ***Charadrius dubius***
9 Lateral edge of the prefrontale and frontale fused or at least in the same alignment (Fig. 5), UBL < 32 mm (Fig. 15). ..... ***Pluvialis apricaria***
– Lateral edge of the prefrontale separated from the frontale (cf. Fig. 3), UBL > 32 mm (Fig. 17). ..... ***Pluvialis squatarola***
10 Ventral orbit edge closed, i. e. fusion between lacrimal and postorbital process (Fig. 6). **11**
– Ventral orbit edge not closed (Fig. 7). **13**
11 Cranium massive (CH > 22 mm, CW > 22 mm, SOW > 9 mm), rostral part of upper bill laterally not enlarged (Fig. 25). ..... ***Scolopax rusticola***

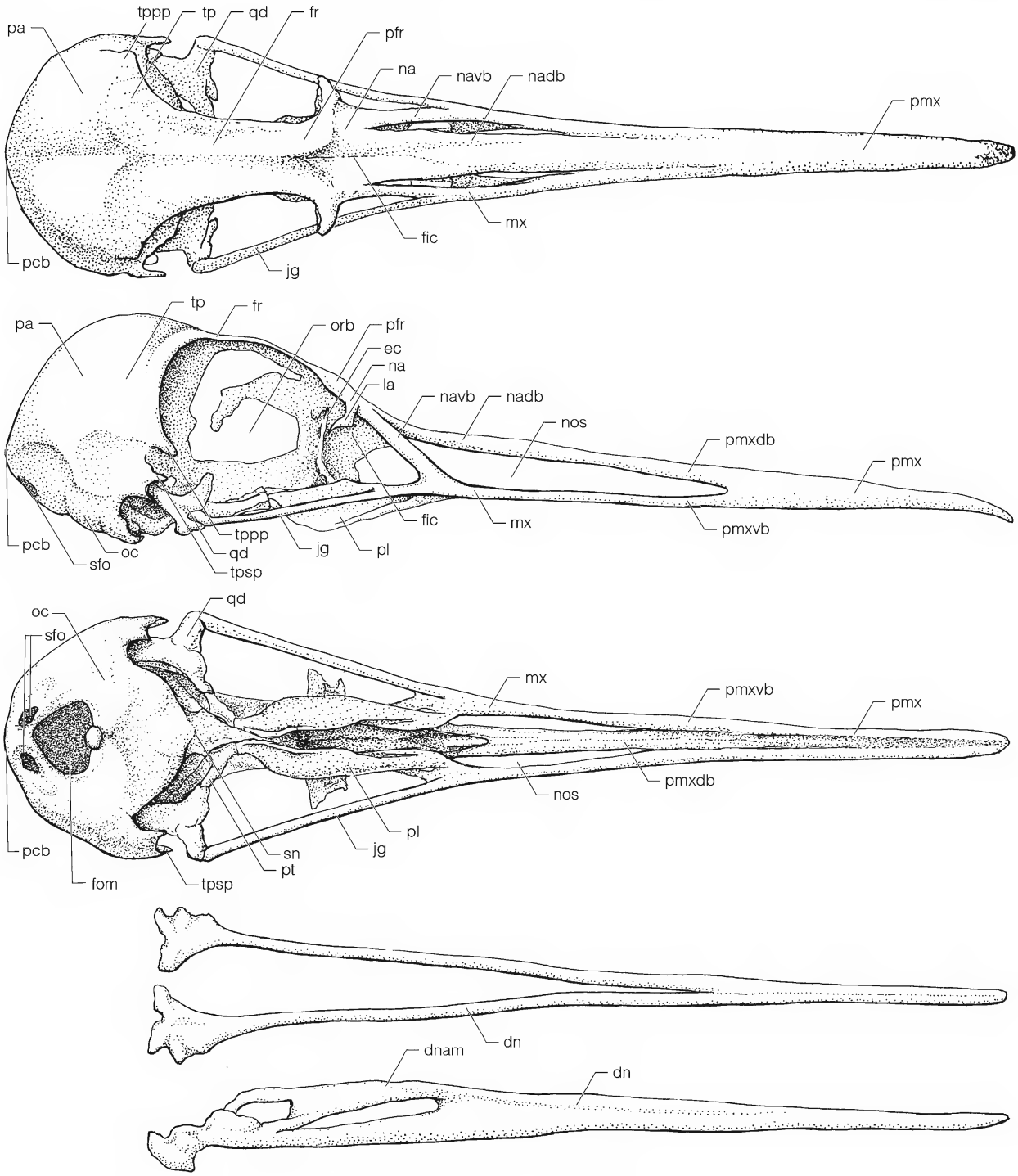


Fig. 1a. Detailed morphological terminology of a shorebird skull (*Tringa totanus*), in dorsal, lateral and ventral views (not all terms are used in the text). – [dn] dental/angular with [dnam] angulus mandibulae; [ec] ectethmoid; [fic] fissura craniofacialis; [fom] foramen magnum; [fr] frontal; [jq] jugal/quadratojugal; [la] lacrimal; [mx] maxillar; [na] nasal with [nadb] dorsal bar and [navb] ventral bar; [nos] nostril; [oc] occipital; [orb] orbita; [pcb] prominetia cerebellaris; [pfr] prefrontal; [pl] palatine; [pmx] premaxillar with [pmxdb] dorsal bar and [pmxvb] ventral bar; [pa] parietal; [pt] pterygoid; [qd] quadrate; [sn] sphenoidal; [sfo] supraoccipital foramina; [tp] temporal with [tppp] postorbital process and [tpsp] suprameatic process.

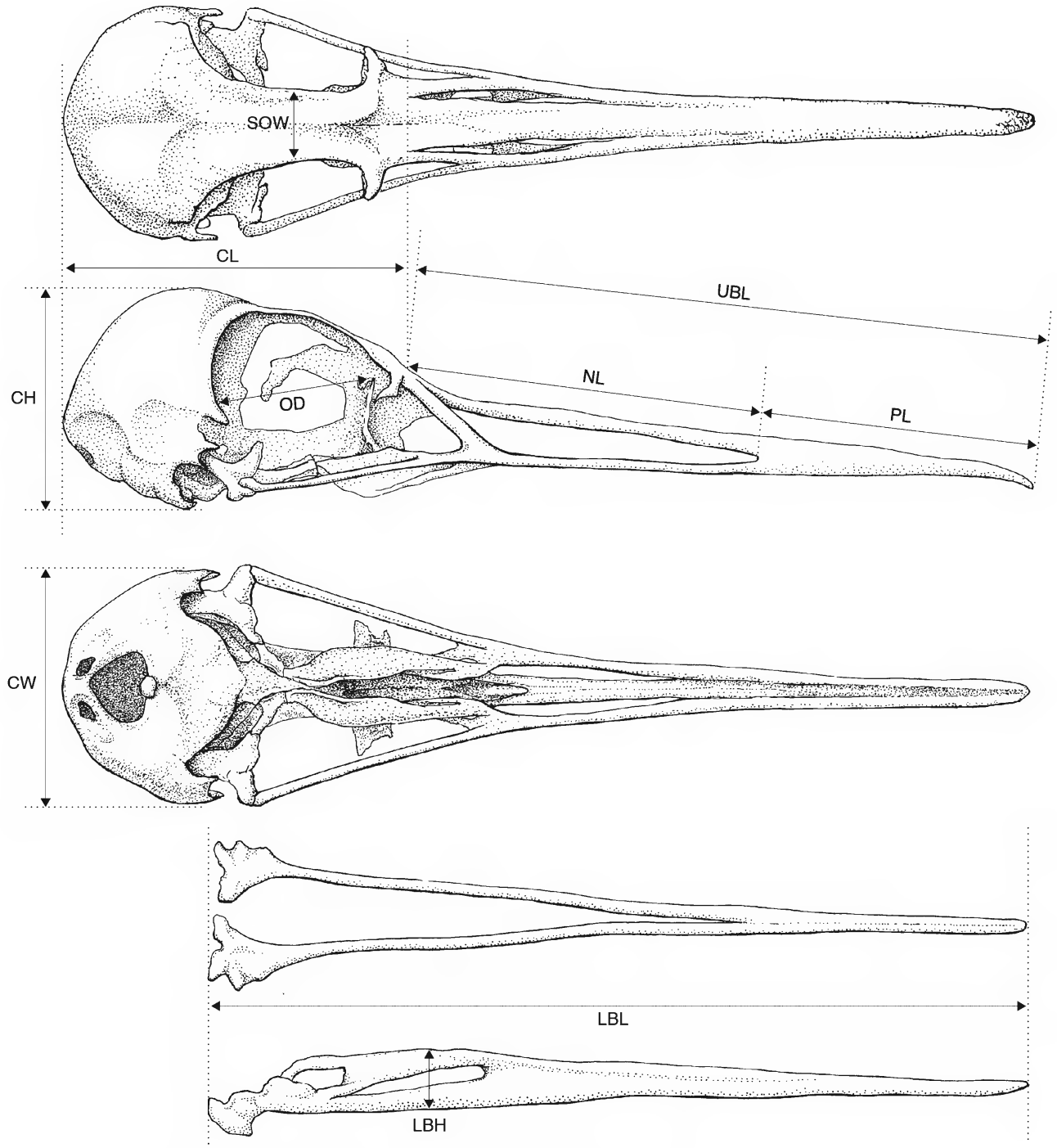
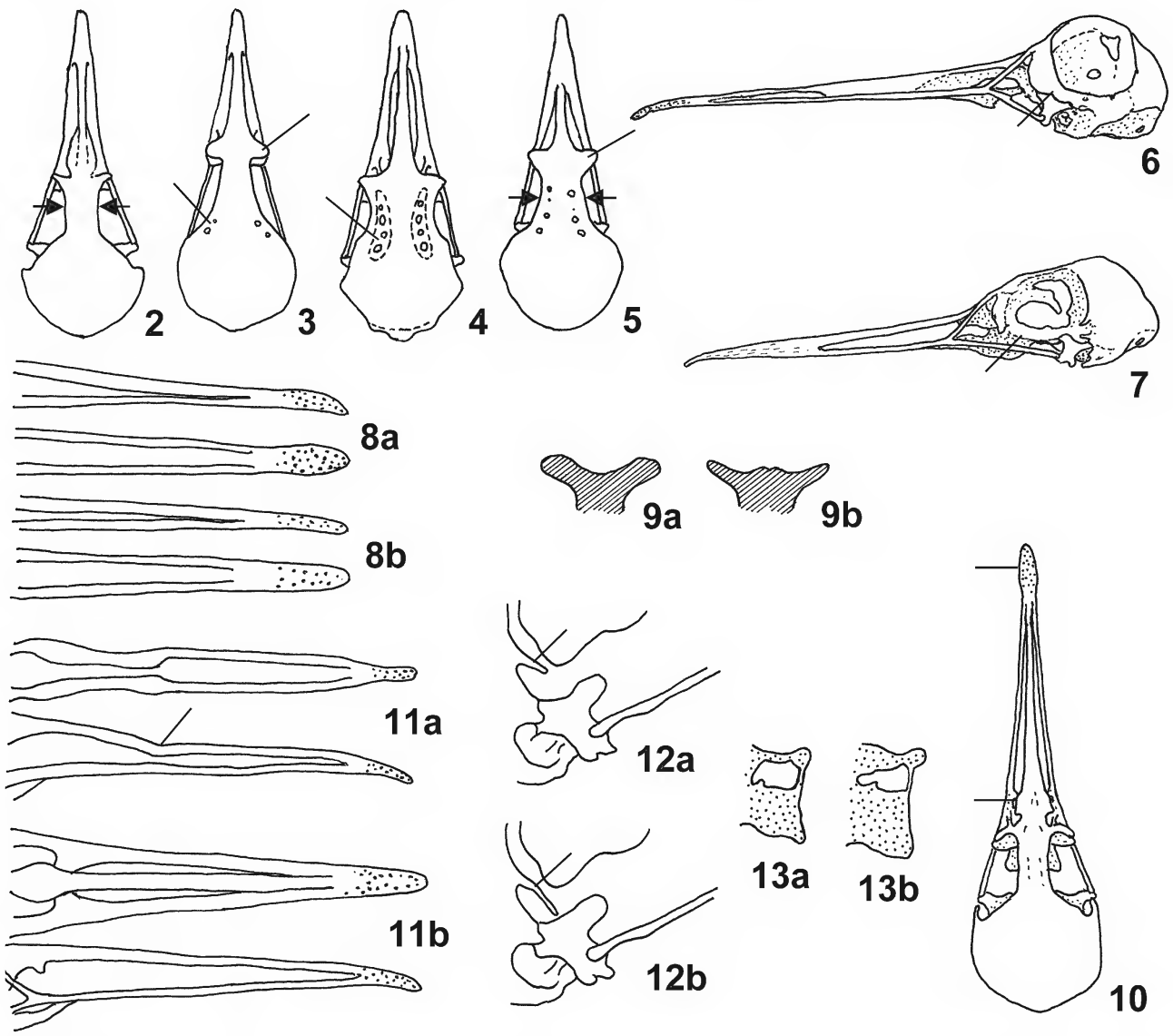


Fig. 1b. Measurements of a shorebird skull (*Tringa totanus*); definitions and abbreviations see section 2.



Figs. 2–13. Details of shorebird skulls. – **2**. *Arenaria interpres*, dorsal view. **3**. *Charadrius alexandrinus*, dorsal view. **4**. *Vanellus vanellus*, dorsal view. **5**. *Pluvialis apricaria*, dorsal view. **6**. *Scolopax rusticola*, lateral view. **7**. *Tringa totanus*, lateral view. **8**. Bill tips in lateral and dorsal views of (a) *Limosa limosa* and (b) *L. lapponica*. **9**. Transversal cross section of the supraorbital isthmus of (a) *Limosa limosa* and (b) *L. lapponica*. **10**. *Calidris canutus*, dorsal view. **11**. Bill in lateral and dorsal views of (a) *Limicola falcinellus* and (b) *Calidris* sp. **12**. Postorbital process in caudo-lateral view of (a) *Calidris maritima* and (b) *C. ferruginea*. **13**. Lacrimal, orbital view, of (a) *Tringa glareola* and (b) *T. ochropus*. – Arrows indicate important characteristics (see text).

– Cranium smaller (CH < 17 mm, CW < 17 mm, SOW < 7 mm), rostral part of upper bill lateral slightly enlarged laterally. .. **12**
12 TL > 75 mm, UBL > 55 mm (Fig. 26). ... ***Gallinago gallinago***
– TL < 75 mm, UBL < 55 mm (Fig. 27). ... ***Lymnocryptes minimus***
13 TL > 100 mm. ... **14**
– TL < 100 mm. ... **17**
14 Rostral half of bill curved down. ... (*Numenius*) **15**
– Bill straight or slightly curved up. ... (*Limosa*) **16**
15 TL > 150 mm (Fig. 21). ... ***Numenius arquata***
– TL < 150 mm (Fig. 22). ... ***Numenius phaeopus***
16 Bill straight, bill tip cap-shaped (Fig. 8a), supraorbital isthmus V-shaped (Figs. 9a, 23). ... ***Limosa limosa***
– Bill straight or slightly curved up, tip of bill flat (Fig. 8b), supraorbital isthmus W-shaped (Figs. 9b, 24). ... ***Limosa lapponica***
17 CW < 22 mm. ... **18**
– CW > 22 mm (Fig. 45). ... (Haematopodidae) only ***Haematopus ostralegus***
18 Lacrimal pin- or bow-shaped. ... (Recurvirostridae) **19**
– Lacrimal planar, 2-dimensional. ... **20**
19 Bill conspicuously up-curved, distinct processsus prefrontale (Fig. 46). ... ***Recurvirostra avosetta***
– Bill straight, no distinct processsus prefrontale, prefrontale and frontale fused (Fig. 47). ... ***Himantopus himantopus***
20 Basal end of the fronto-nasal hinge with lateral extensions (Figs. 10, 11b), bill tip short (PL < 0.25 UBL), distinct Herbst corpuscles. ... **21**
– Other combination of characters. ... **30**
21 Rostral half of nostrils differing from apical half by narrow slit shape, center of frontal-nasal hinge with a distinct transversal dorsal indentation (Figs. 11a, 38). ... ***Limicola falcinellus***
– Nostrals consistently tapering towards bill tip, no distinct transversal dorsal indentation in center of frontal hinge (Fig. 11b). ... **22**
22 CL > 23 mm, prominetia cerebellaris salient/prominent (Fig. 36). ... ***Philomachus pugnax***
– CL < 23 mm, prominetia cerebellaris not salient/prominent (Figs. 28–35). ... (*Calidris*) **23**
23 TL < 40 mm. ... **24**
– TL > 40 mm. ... **25**
24 Bill tip slightly spoon-shaped (cf. Fig. 10) (Fig. 30). ... ***Calidris minuta***
– Bill tip not widened, consistently tapering towards bill tip (Fig. 31). ... ***Calidris temminckii***
25 Bill straight (Figs. 28, 29, 35). ... **26**
– Bill slightly curved down (Figs. 32–34). [The bill tip distal of the rostral bending-zone can be shaped up or down; therefore it is helpful to take the lower bill shape also into consideration]. ... **28**
26 CW > 15 mm, CH > 14 mm, OD > 11 mm (Fig. 28). ... ***Calidris canutus***
– CW < 15 mm, CH < 14 mm, OD < 10 mm. ... **27**
27 UBL > 35 mm (Fig. 35). ... ***Calidris alpina***
– UBL < 32 mm (Fig. 29). ... ***Calidris alba***
28 NL < 30 mm (Fig. 32). ... ***Calidris melanotos***
– NL > 32 mm. ... **29**
29 Postorbital process elongated (Figs. 12a, 34). ... ***Calidris maritima***
– Postorbital process relatively short (Figs. 12b, 33). ... ***Calidris ferruginea***
30 TL > 50 mm, bill tip elongated and solid (PL > 11 mm). ... (*Tringa*) **31**
– TL < 50 mm, bill tip usually short, if elongated upper bill conspicuously dorso-ventrally flattened. ... **36**
31 TL > 81 mm. ... **32**
– TL < 74 mm. ... **33**
32 Rostral fourth of bill tip (PL) conspicuously curved down, PL > 0.6 UBL (Fig. 39). ... ***Tringa erythropus***
– Rostral bill slightly curved up, PL ± 0.5 UBL (Fig. 42). ... ***Tringa nebularia***
33 TL > 66 mm. ... **34**
– TL < 63 mm. ... **35**
34 CW > 16 mm, dorsal edge of lower bill extremely straight (Fig. 40). ... ***Tringa totanus***
– CW < 15 mm, dorsal edge of lower bill slightly up-curved (Fig. 41). ... ***Tringa stagnatilis***
35 NL < 19 mm, interspace between lacrimal and processus prefrontale ± oval (Figs. 13a, 44). ... ***Tringa glareola***
– NL > 23 mm, interspace between lacrimal and processus prefrontale slit-shaped (Figs. 13b, 43). ... ***Tringa ochropus***
36 Bill broad, conspicuously flattened (Fig. 50). ... ***Phalaropus fulicarius***
– Bill narrow, not flattened. ... **37**
37 Skull tiny (TL < 43 mm, CL < 17 mm), bill tip extremely pointed (Fig. 49). ... ***Phalaropus lobatus***
– Skull larger (TL > 46 mm, CL > 18 mm), bill tip not extremely pointed (Fig. 51). ... ***Actitis hypoleucos***

4 Discussion

If indicated for a given specimen, an effort was made to maintain a balanced sex ratio in selecting the skulls. One noticeable sexual dimorphism in skulls has been identified for the genus *Numenius* (cf. GLUTZ VON BLOTZHEIM et al. 1986). In this case, the crania of the females are larger on average (CW and CH), and they tend to have longer bills (UBL) than the males. However, because the smallest skull of the larger species (*Numenius arquata*) was still larger than the largest skull of the smaller species (*Numenius phaeopus*), this sexual dimorphism was irrelevant in terms of identification. A sexual dimorphism has likewise been reported for the related genus *Limosa* (GLUTZ VON BLOTZHEIM et al. 1986), but is less pronounced. Although the skulls of *Limosa limosa* and *L. lapponica* overlap morphometrically, other characteristics can be used to distinguish between these two species.

Species in the genera *Calidris* and *Charadrius* are not easily distinguishable. The smaller *Calidris* species, as well as *Charadrius dubius* and *Ch. hiaticula* can best be distinguished using a combination of morphometric data. Skulls of *Ch. dubius* are generally larger than those of *Ch. hiaticula*, but a more precise distinction still is difficult.

Lateral extensions on the basal end of the fronto-nasal hinge were identified as taxonomically relevant structures. However, their morphological function has yet to be determined. This characteristic appears in all the *Calidris* species included in this study, but also in *Philomachus* and

Limicola. The idea that *Limicola* is closely related to *Calidris* is further evidenced by the similarities in the behaviour and habits of the two genera. Our morphological analysis of the skulls supports the theory (Glutz von Blotzheim et al. 1999, Joseph & Strauch 1978) that even though *Philomachus* is similar in its habits to the shanks and tattlers (*Tringa*), it more probably is related to *Calidris*.

5 References

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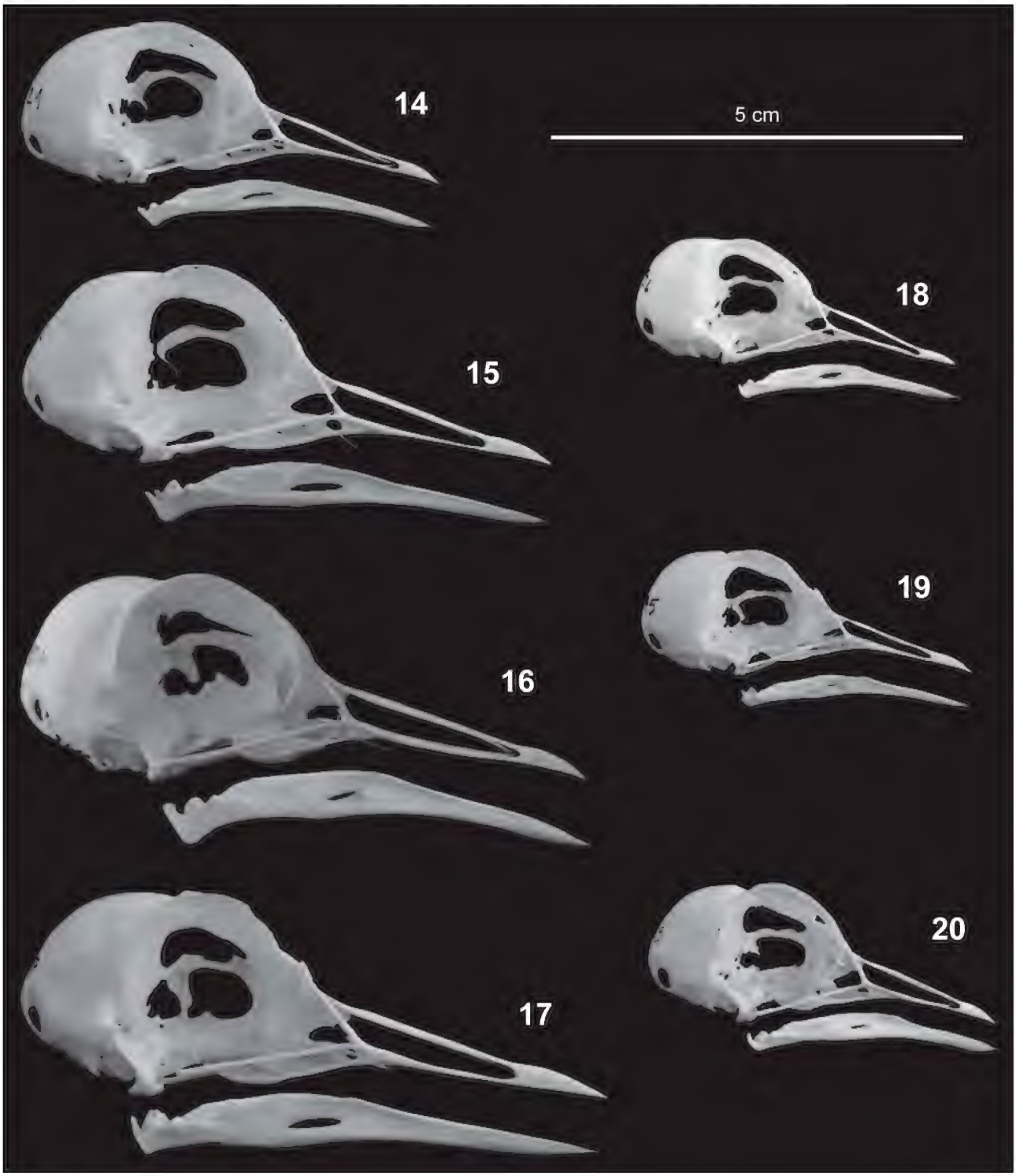
Bauer, H.-G., Bezzel, E. & Fiedler, W. (eds.) (2005): Das Kompendium der Vögel Mitteleuropas. Alles über Biologie, Gefährdung und Schutz, Vol. 1 Nonpasseriformes – Nichtsperlingsvögel, 808 pp.; Wiesbaden (Aula).

Tab. 2. Skull measurements (in mm) of 38 Central European shorebird species (max = maximum, Ø = mean, min = minimum, SD = standard deviation). For abbreviations see section 2 and Fig. 1b.

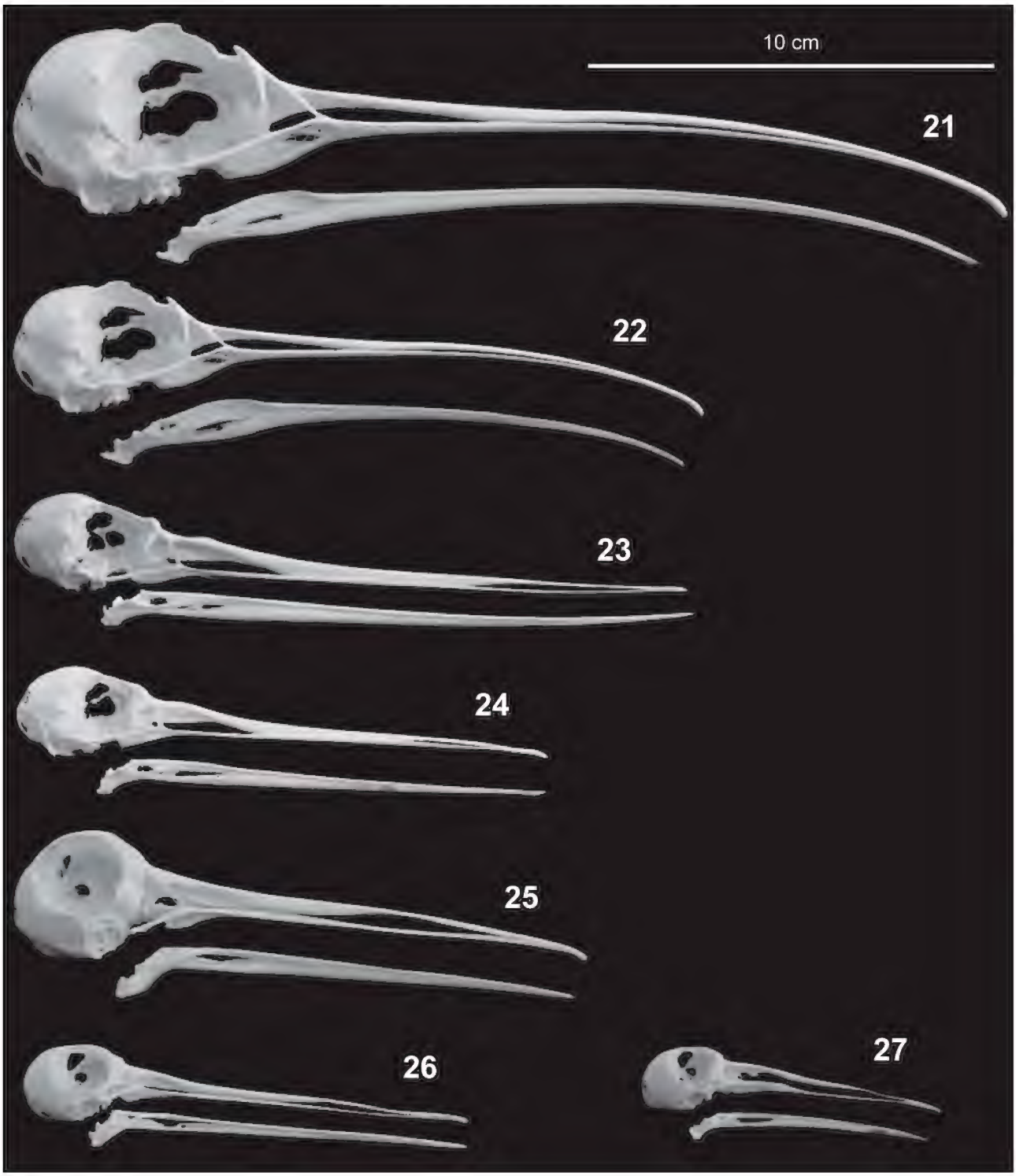
		Skull			Cranium					Upper bill					Lower bill	
Species		**TL**	**CL**	**UBL**	**CH**	**CW**	**OD**	**SOW**	**SG**	**NL**	**PL**	**UBS**	**BTS**	**HC**	**LBL**	**LBH**
Burhinus	max	86.6	42.1	44.8	26.3	30.5	25.7	15.2	yes	24.9	22.2	straight	no	no	70.0	7.2
oedicnemus	**Ø**	**82.5**	**41.0**	**41.5**	**24.4**	**29.5**	**24.3**	**13.6**		**22.4**	**19.1**				**65.9**	**6.8**
n = 9	min	76.5	38.7	37.8	22.7	28.2	21.9	12.1		19.4	14.6				63.4	6.1
	SD	11.0	1.6	5.8	1.2	0.6	1.6	0.9		3.0	4.6				6.5	0.2
Pluvialis	max	68.9	32.1	37.4	21.2	22.6	20.1	11.2	yes	24.6	13.8	straight	no	no	53.7	5.8
squatarola	**Ø**	**66.7**	**31.3**	**35.4**	**20.5**	**22.0**	**19.6**	**9.1**		**22.8**	**12.6**				**51.1**	**5.5**
n = 10	min	63.8	30.5	32.9	19.9	21.1	19.1	7.8		20.2	10.1				47.7	5.1
	SD	2.7	0.4	2.4	0.2	0.2	0.1	1.0		1.7	1.4				3.3	0.1
Vanellus	max	67.9	31.5	36.4	20.6	22.0	18.6	12.5	yes	28.9	9.1	straight	no	no	47.9	5.8
vanellus	**Ø**	**63.3**	**29.7**	**33.6**	**20.1**	**21.1**	**18.3**	**11.1**		**25.9**	**7.7**				**46.1**	**5.1**
n = 10	min	60.7	29.1	31.4	19.5	20.4	17.5	9.3		24.4	6.1				44.3	4.7
	SD	3.8	0.6	1.9	0.1	0.3	0.1	1.2		1.9	0.7				1.8	0.1
Pluvialis	max	61.9	30.8	31.1	20.1	21.6	19.7	11.0	yes	23.3	10.8	straight	no	no	46.5	5.2
apricaria	**Ø**	**59.1**	**29.2**	**29.9**	**19.5**	**20.7**	**18.9**	**9.8**		**21.9**	**8.0**				**43.9**	**4.5**
n = 10	min	57.4	28.1	29.0	18.6	19.6	17.9	8.8		19.1	6.7				40.9	3.7
	SD	1.9	0.7	0.4	0.2	0.6	0.3	0.5		2.5	2.1				2.7	0.2
Charadrius	max	51.1	26.7	25.7	17.5	17.6	16.0	8.3	yes	19.0	6.7	straight	no	no	36.0	3.3
morinellus	**Ø**	**50.5**	**26.2**	**24.3**	**17.4**	**17.5**	**15.4**	**7.7**		**17.8**	**6.5**				**35.5**	**3.3**
n = 2	min	49.5	25.7	22.8	17.3	17.4	14.8	7.0		16.6	6.2				35.0	3.3
	SD	1.8	0.5	4.2	0.0	0.0	0.7	0.8		2.9	0.1				0.5	0.0
Charadrius	max	43.8	22.7	21.1	14.9	16.6	13.8	8.0	yes	16.2	5.0	straight	no	no	31.2	3.1
hiaticula	**Ø**	**40.0**	**21.5**	**18.5**	**14.1**	**15.9**	**13.2**	**6.6**		**13.8**	**4.7**				**28.1**	**2.7**
n = 10	min	37.2	20.1	17.1	13.6	15.0	12.2	5.5		12.4	4.0				26.0	2.5
	SD	3.9	0.7	1.6	0.2	0.2	0.3	0.7		1.5	0.1				2.5	0.0
Charadrius	max	40.9	21.3	20.0	13.7	15.7	14.0	5.4	yes	14.7	6.0	straight	no	no	29.8	3.0
alexandrinus	**Ø**	**39.6**	**20.5**	**19.1**	**13.2**	**15.3**	**13.3**	**4.6**		**13.7**	**5.4**				**28.6**	**2.5**
n = 10	min	38.6	19.7	18.5	12.9	14.7	12.0	3.7		12.6	4.7				27.1	2.3
	SD	0.6	0.2	0.3	0.1	0.1	0.3	0.4		0.5	0.2				0.6	0.0
Charadrius	max	37.8	19.8	18.4	13.0	14.2	11.6	6.4	yes	14.0	6.5	straight	no	no	26.8	2.8
dubius	**Ø**	**36.9**	**19.2**	**17.7**	**12.5**	**13.7**	**11.2**	**4.8**		**12.9**	**4.8**				**25.5**	**2.7**
n = 10	min	36.0	18.0	16.8	12.0	13.1	10.5	3.6		11.6	4.0				24.0	2.5
	SD	0.4	0.3	0.3	0.1	0.2	0.1	0.6		0.6	0.6				0.9	0.0
Recurvirostra	max	115.6	27.3	89.4	19.5	20.5	14.5	10.0	yes	36.3	53.7	curved	no	no	104.0	4.7
avosetta	**Ø**	**109.1**	**26.1**	**83.0**	**18.1**	**19.1**	**13.6**	**7.5**		**34.8**	**48.2**	up			**97.7**	**4.3**
n = 10	min	102.9	25.3	77.6	17.2	18.0	12.5	5.4		32.0	42.3				90.1	4.0
	SD	18.3	0.5	14.5	0.4	0.5	0.3	1.9		2.4	13.2				17.8	0.1
Haematopus	max	115.0	35.6	82.5	25.7	26.3	19.7	12.1	yes	52.5	30.0	slightly	no	no	101.0	8.0
ostralegus	**Ø**	**106.1**	**33.4**	**72.7**	**24.6**	**24.7**	**19.0**	**10.5**		**46.4**	**26.3**	curved			**91.2**	**7.5**
n = 10	min	95.0	32.0	61.8	23.3	23.7	18.5	9.4		34.9	19.6	up			78.6	6.5
	SD	35.9	1.5	36.7	0.6	0.7	0.1	0.8		25.6	8.8				42.7	0.2

		Skull			Cranium					Upper bill					Lower bill	
Species		**TL**	**CL**	**UBL**	**CH**	**CW**	**OD**	**SOW**	**SG**	**NL**	**PL**	**UBS**	**BTS**	**HC**	**LBL**	**LBH**
Himantopus himantopus n=8	max	104.2	29.0	75.5	19.2	20.3	17.5	9.5	yes	39.4	36.7	straight	no	no	90.6	4.3
	Ø	**97.5**	**27.8**	**69.7**	**18.3**	**19.8**	**16.5**	**8.9**		**36.9**	**32.8**				**85.8**	**4.1**
	min	91.0	26.2	63.3	17.4	18.9	15.7	8.2		33.1	25.6				82.5	3.9
	SD	17.1	1.0	17.2	0.4	0.2	0.4	0.2		4.4	15.0				7.5	0.0
Numenius arquata n=10	max	219.0	38.5	181.0	26.8	26.2	21.7	14.0	yes	168.0	30.0	curved	yes	yes	196.0	9.4
	Ø	**195.9**	**36.5**	**159.4**	**25.5**	**25.1**	**19.4**	**11.1**		**141.5**	**17.9**	down			**173.8**	**8.1**
	min	164.2	31.2	133.0	21.0	20.5	15.1	6.3		118.0	13.0				146.0	3.0
	SD	240.9	4.8	188.5	2.8	2.9	3.3	4.4		263.2	33.4				183.3	3.5
Limosa lapponica n=10	max	142.4	29.9	113.0	19.6	21.5	16.6	7.1	no	105.0	10.0	straight	yes	yes	124.0	5.1
	Ø	**129.5**	**28.5**	**101.0**	**18.6**	**20.5**	**15.4**	**6.5**		**93.5**	**7.5**				**114.2**	**4.7**
	min	111.5	26.5	85.0	17.9	19.5	13.8	5.1		70.0	4.0				98.0	4.3
	SD	121.2	0.9	107.5	0.3	0.4	0.6	0.5		116.3	2.3				93.3	0.1
Limosa limosa n=10	max	149.1	30.5	121.0	20.1	20.5	15.1	8.2	no	114.0	9.0	slightly	slightly	yes	129.0	5.4
	Ø	**129.3**	**28.3**	**101.0**	**19.2**	**19.8**	**14.5**	**7.6**		**94.2**	**6.8**	curved			**111.8**	**4.9**
	min	115.3	27.3	87.5	18.1	18.8	13.4	7.1		81.1	5.2	up			100.4	4.1
	SD	89.2	1.0	90.8	0.4	0.3	0.3	0.1		90.6	1.3				88.9	0.1
Numenius phaeopus n=9	max	131.3	34.1	97.0	24.5	23.6	20.2	7.1	yes	85.2	12.6	curved	yes	yes	117.5	7.6
	Ø	**127.4**	**33.4**	**94.0**	**22.2**	**22.2**	**19.3**	**6.5**		**82.3**	**11.7**	down			**99.4**	**6.7**
	min	122.3	32.6	89.7	21.2	20.6	18.7	5.8		79.6	10.1				88.1	6.0
	SD	18.1	0.4	13.3	2.4	1.5	0.5	0.3		9.7	1.2				163.8	0.6
Scolopax rusticola n=10	max	119.6	30.6	89.0	24.3	23.9	17.9	12.5	no	78.0	13.0	straight	yes	yes	94.0	5.2
	Ø	**112.9**	**28.9**	**84.0**	**23.3**	**23.0**	**17.0**	**10.6**		**72.7**	**11.3**				**88.4**	**4.6**
	min	104.5	27.7	76.0	22.0	22.2	15.9	9.3		66.0	10.0				82.0	4.2
	SD	17.9	0.8	16.0	0.5	0.3	0.5	1.0		13.1	0.9				14.9	0.1
Gallinago gallinago n=10	max	100.3	23.1	78.7	16.6	16.9	12.2	6.4	no	65.3	13.6	straight	yes	yes	87.4	3.0
	Ø	**94.8**	**22.2**	**72.6**	**15.7**	**16.4**	**11.4**	**5.5**		**61.5**	**11.1**				**79.5**	**2.7**
	min	87.6	21.6	65.6	15.2	15.9	10.7	5.0		57.4	8.2				69.3.2	2.5
	SD	18.6	0.3	17.9	0.2	0.1	0.2	0.2		9.6	3.4				4.6	0.0
Lymnocryptes minimus n=4	max	69.6	20.9	49.0	14.4	15.0	10.1	4.5	no	42.4	8.4	straight	yes	yes	54.7	3.2
	Ø	**68.2**	**19.8**	**48.4**	**13.9**	**14.3**	**9.8**	**3.8**		**41.1**	**7.3**				**52.2**	**3.0**
	min	66.5	18.6	47.9	13.4	13.5	9.4	3.2		39.9	5.5				50.9	2.7
	SD	2.1	1.2	0.2	0.3	0.5	0.1	0.3		1.4	1.7				2.9	0.0
Actitis hypoleucos n=7	max	49.8	20.9	29.9	13.6	13.9	11.7	3.4	no	25.4	6.9	straight	yes	yes	39.2	3.0
	Ø	**48.7**	**19.8**	**28.9**	**13.0**	**13.3**	**10.7**	**2.8**		**23.7**	**5.2**				**38.4**	**2.7**
	min	47.9	18.9	28.0	12.5	12.9	10.0	2.4		22.0	3.2				36.6	2.4
	SD	0.5	0.5	0.3	0.2	0.1	0.3	0.2		2.1	2.2				0.8	0.0
Phalaropus fulicarius n=3	max	47.2	18.0	29.8	12.0	12.0	9.6	2.6	no	25.1	5.3	straight	no	yes	38.7	2.7
	Ø	**45.7**	**17.7**	**28.0**	**11.6**	**11.8**	**9.4**	**2.5**		**23.3**	**4.7**				**36.4**	**2.6**
	min	44.8	17.4	27.1	11.3	11.4	9.2	2.5		21.8	4.1				34.6	2.6
	SD	1.7	0.1	2.3	0.1	0.1	0.0	0.0		2.8	0.4				4.4	0.0
Phalaropus lobatus n=1	**Ø**	**41.4**	**15.4**	**26.0**	**10.6**	**10.9**	**8.2**	**1.5**	no	**22.0**	**4.0**	straight	no	yes	**33.5**	**1.8**
Tringa erythropus n=10	max	94.5	26.0	68.6	16.9	17.8	13.9	6.2	no	25.4	45.2	straight	no	yes	82.6	4.5
	Ø	**88.7**	**25.3**	**63.4**	**16.3**	**16.9**	**13.3**	**5.4**		**23.3**	**40.1**				**77.2**	**4.1**
	min	82.8	24.2	57.0	15.6	16.4	12.2	4.5		21.8	34.4				71.0	3.4
	SD	13.9	0.3	12.2	0.1	0.2	0.2	0.2		1.4	9.3				12.2	0.1
Tringa nebularia n=4	max	92.0	27.5	64.5	18.0	18.6	15.7	5.7	no	35.6	33.3	slightly	no	yes	79.3	5.2
	Ø	**87.0**	**27.1**	**59.9**	**17.5**	**18.2**	**15.2**	**5.1**		**30.6**	**29.3**	curved			**75.4**	**5.0**
	min	81.9	26.5	55.4	17.0	17.7	14.6	4.4		25.4	22.8	up			72.7	4.8
	SD	18.2	0.2	15.3	0.2	0.1	0.2	0.4		17.6	21.0				9.0	0.0
Tringa totanus n=10	max	73.7	25.2	48.7	16.9	17.2	14.0	4.7	no	29.1	21.4	straight	no	yes	62.0	4.4
	Ø	**71.4**	**24.5**	**46.9**	**16.3**	**16.8**	**13.1**	**4.2**		**27.0**	**19.9**				**59.4**	**4.0**
	min	67.3	22.3	44.7	14.7	16.2	12.3	3.9		25.0	17.7				57.8	3.6
	SD	3.6	0.7	2.0	0.4	0.1	0.3	0.1		1.8	1.3				1.8	0.1

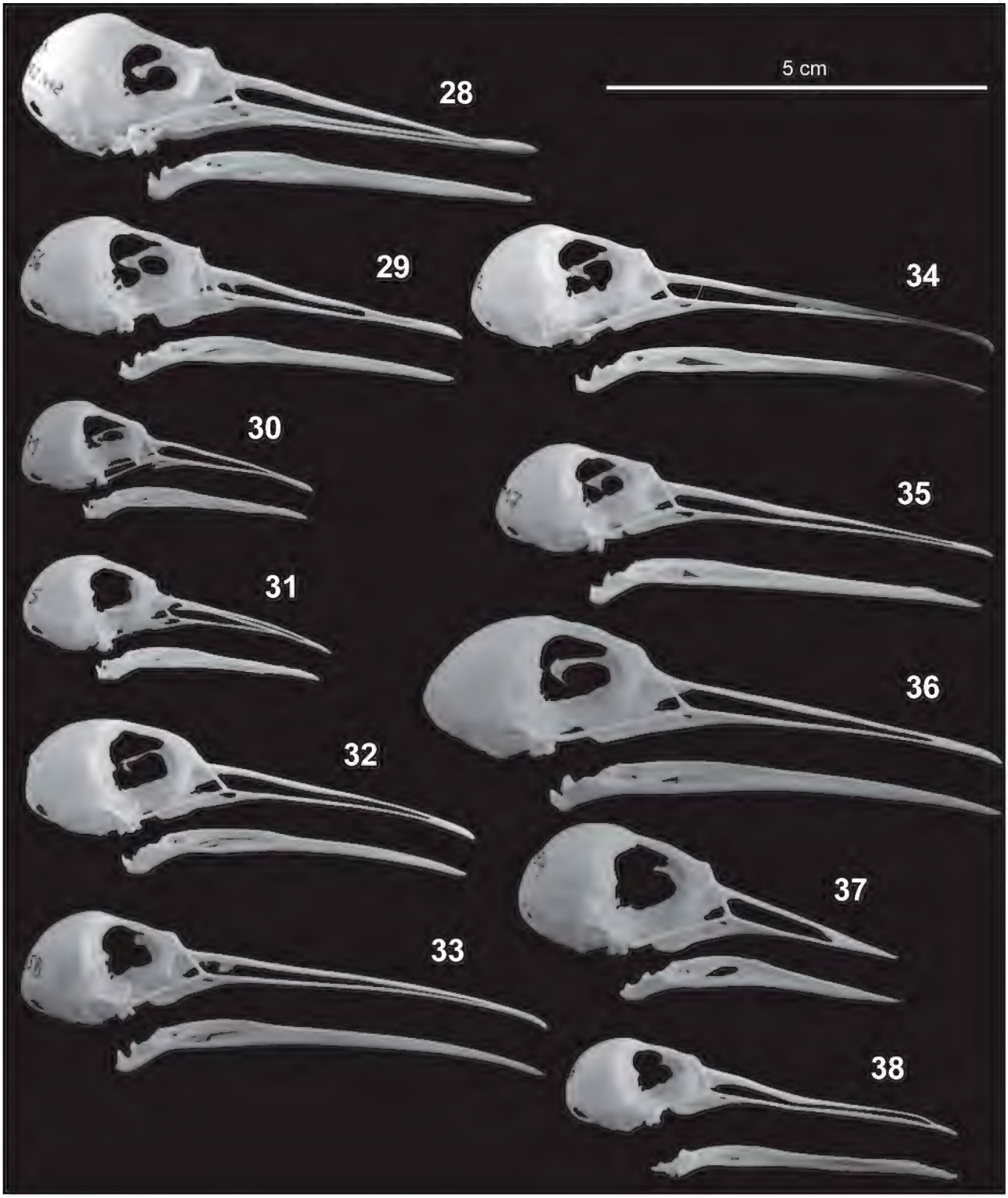
		Skull			Cranium					Upper bill					Lower bill	
Species		**TL**	**CL**	**UBL**	**CH**	**CW**	**OD**	**SOW**	**SG**	**NL**	**PL**	**UBS**	**BTS**	**HC**	**LBL**	**LBH**
Tringa	max	72.5	20.8	51.8	13.9	14.4	11.2	3.3	no	28.8	23.0	straight	no	yes	61.0	2.8
stagnatilis	**Ø**	**68.6**	**20.7**	**47.9**	**13.6**	**14.1**	**11.0**	**3.0**		**27.1**	**20.8**				**57.9**	**2.7**
n=3	min	66.0	20.6	45.2	13.2	14.0	10.9	2.6		24.9	17.5				55.3	2.6
	SD	11.7	0.0	11.9	0.1	0.1	0.0	0.1		4.0	8.5				8.4	0.0
Tringa	max	62.4	21.8	40.6	14.3	14.6	12.1	4.0	no	26.3	14.3	straight	no	yes	53.2	3.2
ochropus	**Ø**	**59.5**	**21.1**	**38.4**	**13.9**	**14.4**	**11.5**	**3.8**		**25.3**	**13.1**				**49.0**	**2.9**
n=4	min	56.5	20.7	35.5	13.2	14.2	11.2	3.6		23.8	11.7				45.6	2.6
	SD	6.0	0.2	4.7	0.2	0.0	0.2	0.0		1.3	1.1				9.9	0.1
Tringa	max	56.5	22.0	34.5	14.4	15.0	12.7	4.5	no	18.3	16.7	straight	no	yes	46.1	3.2
glareola	**Ø**	**54.4**	**21.5**	**33.0**	**14.0**	**14.4**	**11.8**	**3.9**		**17.4**	**15.6**				**44.5**	**2.9**
n=9	min	51.8	21.1	30.6	13.4	13.8	10.7	3.0		16.4	13.2				42.6	2.7
	SD	2.5	0.1	2.0	0.1	0.2	0.6	0.2		0.5	1.2				1.5	0.0
Philomachus	max	70.5	26.8	44.0	17.1	18.0	14.3	5.6	no	35.8	9.4	slightly	yes	yes	58.3	4.8
pugnax	**Ø**	**65.9**	**25.3**	**40.6**	**16.2**	**17.0**	**13.0**	**4.4**		**32.6**	**8.0**	curved			**54.1**	**3.9**
n=10	min	58.9	23.0	35.7	15.1	15.8	11.8	3.3		28.2	6.00	down			46.6	3.3
	SD	21.3	2.9	9.2	0.4	0.8	0.7	0.7		6.0	1.0				20.3	0.2
Calidris									no			curved	yes	yes		
maritima	**Ø**	**62.9**	**21.5**	**41.4**	**14.0**	**15.2**	**10.2**	**2.8**		**34.1**	**7.3**	down			**51.0**	**2.9**
n=1																
Calidris	max	65.5	19.5	46.3	13.3	14.6	10.2	4.0	no	40.5	7.0	curved	yes	yes	53.5	3.4
ferruginea	**Ø**	**61.3**	**18.9**	**42.4**	**12.8**	**14.1**	**9.9**	**3.2**		**36.9**	**5.5**	down			**49.6**	**3.1**
n=10	min	55.1	18.2	36.2	12.2	13.6	9.3	2.4		32.1	4.1				44.1	2.8
	SD	9.3	0.2	9.0	0.1	0.1	0.1	0.2		7.9	0.6				7.8	0.1
Calidris	max	62.1	23.2	40.2	15.5	16.7	12.7	4.2	no	34.2	6.4	straight	yes	yes	52.0	3.9
canutus	**Ø**	**60.3**	**22.5**	**37.8**	**15.1**	**16.5**	**12.1**	**3.8**		**32.1**	**5.7**				**47.8**	**3.6**
n=8	min	54.5	21.9	32.0	14.7	16.0	11.4	3.3		26.0	5.1				42.9	3.4
	SD	6.3	0.2	7.3	0.1	0.1	0.2	0.1		7.7	0.2				9.4	0.0
Calidris	max	60.4	19.2	41.6	13.2	14.4	9.5	3.3	no	36.6	5.5	straight	yes	yes	49.1	3.2
alpina	**Ø**	**57.4**	**18.7**	**38.7**	**12.7**	**14.0**	**9.1**	**3.0**		**34.0**	**4.7**				**45.3**	**2.8**
n=10	min	55.5	17.7	36.6	12.3	13.8	8.5	2.5		32.2	4.1				43.2	2.5
	SD	2.5	0.2	2.6	0.1	0.0	0.1	0.1		2.9	0.2				3.7	0.1
Calidris									no			curved	yes	yes		
melanotos	**Ø**	**56.6**	**21.5**	**35.1**	**14.4**	**15.0**	**10.0**	**2.9**		**29.6**	**5.5**	down			**44.4**	**3.0**
n=1																
Limicola	max	56.1	18.4	38.3	12.1	13.6	10.3	2.9	no	34.1	4.2	straight	yes	yes	47.1	3.4
falcinellus	**Ø**	**52.6**	**17.6**	**35.0**	**11.7**	**13.1**	**9.3**	**2.7**		**31.8**	**3.2**				**43.8**	**3.2**
n=6	min	50.3	16.9	32.8	11.2	12.5	8.5	2.5		29.7	2.5				41.0	2.5
	SD	5.4	0.3	4.0	0.1	0.2	0.4	0.0		3.0	0.4				5.3	0.4
Calidris	max	50.7	20.2	31.4	13.2	14.9	11.1	3.2	no	25.2	6.7	straight	yes	yes	39.8	3.4
alba	**Ø**	**48.6**	**19.0**	**29.6**	**12.8**	**14.6**	**10.4**	**2.9**		**23.6**	**6.0**				**38.4**	**2.9**
n=10	min	46.8	18.4	28.1	12.6	14.1	10.0	2.6		22.2	5.5				36.5	2.6
	SD	1.9	0.2	1.1	0.1	0.1	0.2	0.0		0.8	0.1				1.6	0.1
Arenaria	max	49.0	23.6	25.9	15.9	17.2	13.2	4.5	no	17.7	9.4	straight	yes	no	37.6	4.1
interpres	**Ø**	**46.9**	**23.0**	**23.9**	**15.3**	**16.9**	**12.6**	**4.0**		**15.5**	**8.4**				**36.3**	**3.8**
n=10	min	44.8	22.3	22.0	15.0	16.7	11.7	3.5		14.2	7.8				33.4	3.2
	SD	1.7	0.2	1.3	0.1	0.0	0.2	0.1		1.2	0.2				1.6	0.1
Calidris	max	39.1	16.7	22.5	10.9	11.9	8.4	2.4	no	18.8	4.5	straight	yes	yes	28.8	2.2
temminckii	**Ø**	**37.9**	**16.3**	**21.6**	**10.6**	**11.5**	**8.1**	**2.2**		**17.7**	**3.9**				**27.6**	**2.0**
n=5	min	35.8	15.6	20.2	10.3	10.7	7.8	2.0		16.3	3.2				26.0	1.8
	SD	2.5	0.2	1.5	0.1	0.2	0.1	0.0		1.0	0.3				1.4	0.0
Calidris	max	39.8	16.1	23.9	10.7	12.0	8.9	2.4	no	20.0	4.7	straight	yes	yes	30.9	2.3
minuta	**Ø**	**37.7**	**15.7**	**22.0**	**10.6**	**11.7**	**8.2**	**2.0**		**17.8**	**4.2**				**28.6**	**2.2**
n=4	min	36.8	15.5	20.8	10.4	11.2	7.4	1.8		16.1	3.9				27.5	2.2
	SD	2.0	0.1	1.9	0.0	0.1	0.4	0.1		2.7	0.1				2.5	0.0



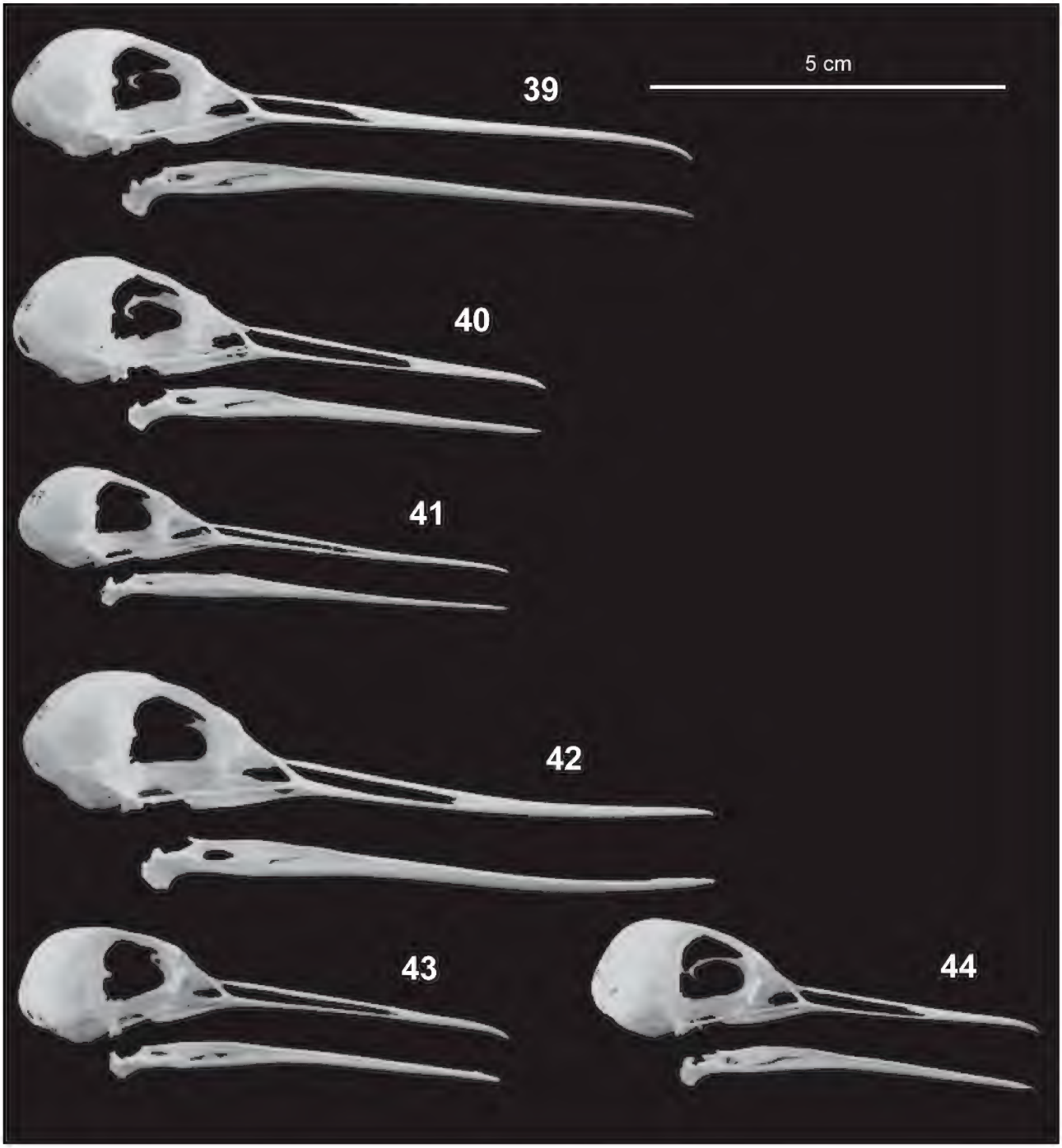
Figs. 14–20. Skulls of Charadriidae, lateral view. – **14**. *Charadrius morinellus*. **15**. *Pluvialis apricaria*. **16**. *Vanellus vanellus*. **17**. *Pluvialis squatarola*. **18**. *Charadrius dubius*. **19**. *Ch. hiaticula*. **20**. *Ch. alexandrinus*.



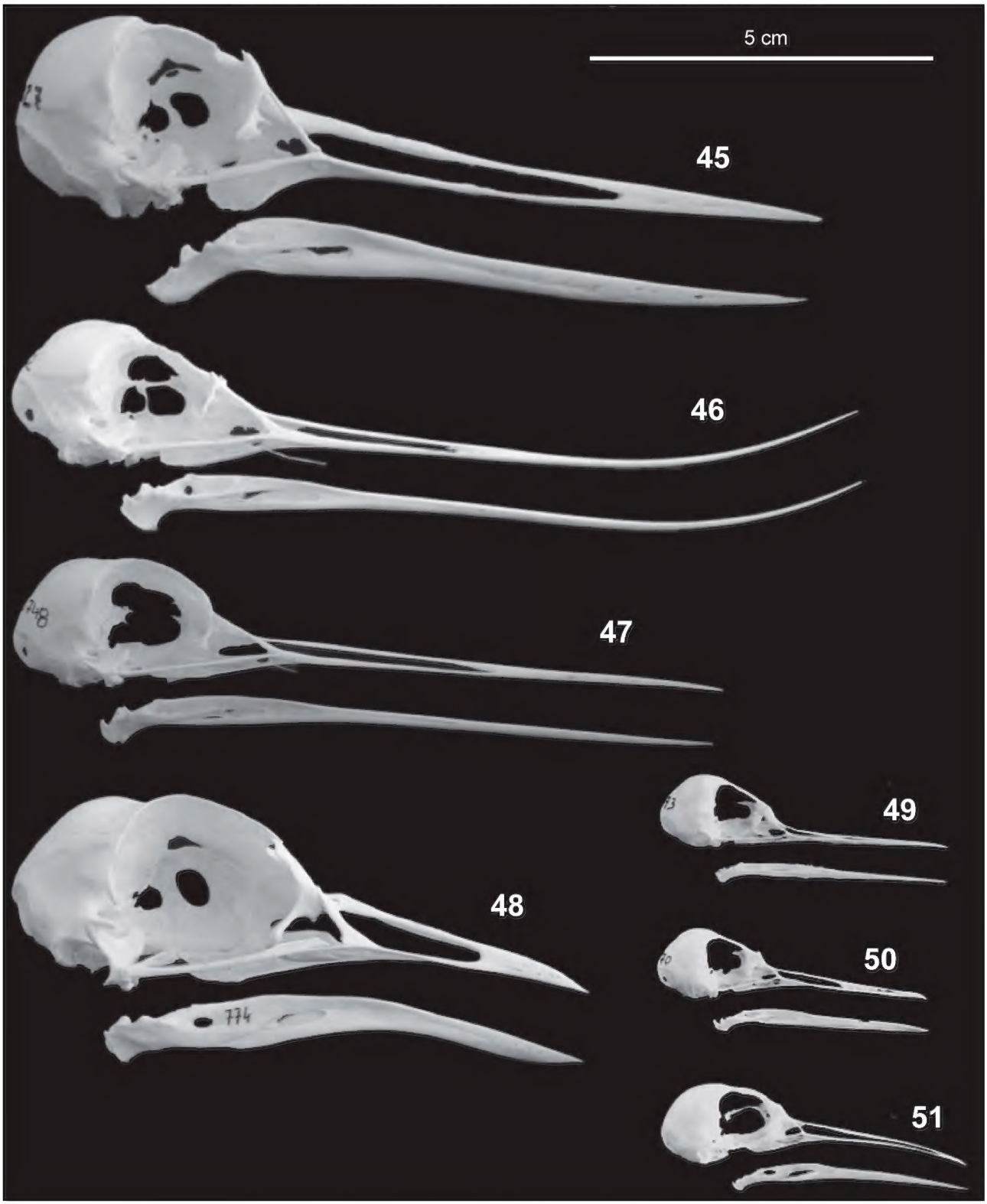
Figs. 21–27. Skulls of *Numenius*, *Limosa* and snipes, lateral view. – **21**. *Numenius arquata*. **22**. *N. phaeopus*. **23**. *Limosa limosa*. **24**. *L. lapponica*. **25**. *Scolopax rusticola*. **26**. *Gallinago gallinago*. **27**. *Lymnocryptes minimus*.



Figs. 28–38. Skulls of various sandpipers, lateral view. – **28**. *Calidris canutus*. **29**. *C. alba*. **30**. *C. minuta*. **31**. *C. temminckii*. **32**. *C. melanotus*. **33**. *C. ferruginea*. **34**. *C. maritima*. **35**. *C. alpina*. **36**. *Philomachus pugnax*. **37**. *Arenaria interpres*. **38**. *Limicola falcinellus*.



Figs. 39–44. Skulls of *Tringa*, lateral view. – **39**. *Tringa erythropus*. **40**. *T. totanus*. **41**. *T. stagnatilis*. **42**. *T. nebularia*. **43**. *T. ochropus*. **44**. *T. glareola*.



Figs. 45–51. Skulls of Haematopodidae, Recurvirostridae, Burhinidae, *Phalaropus* and *Actitis*, lateral view. **45**. *Haematopus ostralegus*. **46**. *Recurvirostra avosetta*. **47**. *Himantopus himantopus*. **48**. *Burhinus oedicnemus*. **49**. *Phalaropus lobatus*. **50**. *P. fulicarius*. **51**. *Actitis hypoleucos*.

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